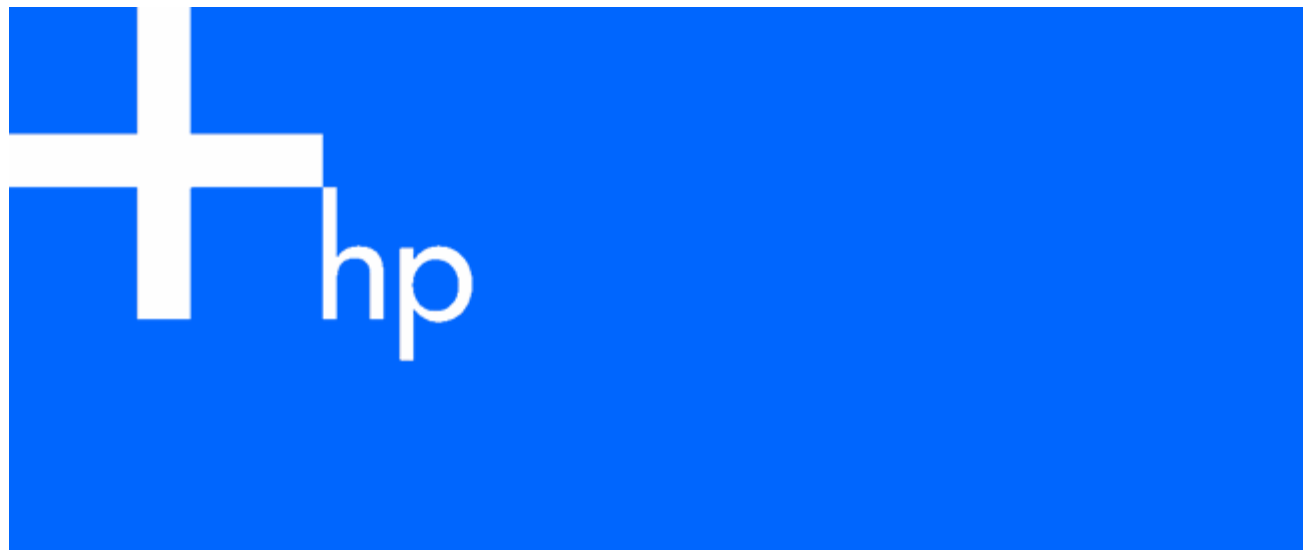


HP ProLiant ML350 Generation 4p Server Maintenance and Service Guide



July 2006 (Second Edition)
Part Number 382586-002



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Audience assumptions

This guide is for an experienced service technician. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

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Illustrated parts catalog

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Customer self repair

What is customer self repair?

HP's customer self-repair program offers you the fastest service under either warranty or contract. It enables HP to ship replacement parts directly to you so that you can replace them. Using this program, you can replace parts at your own convenience.

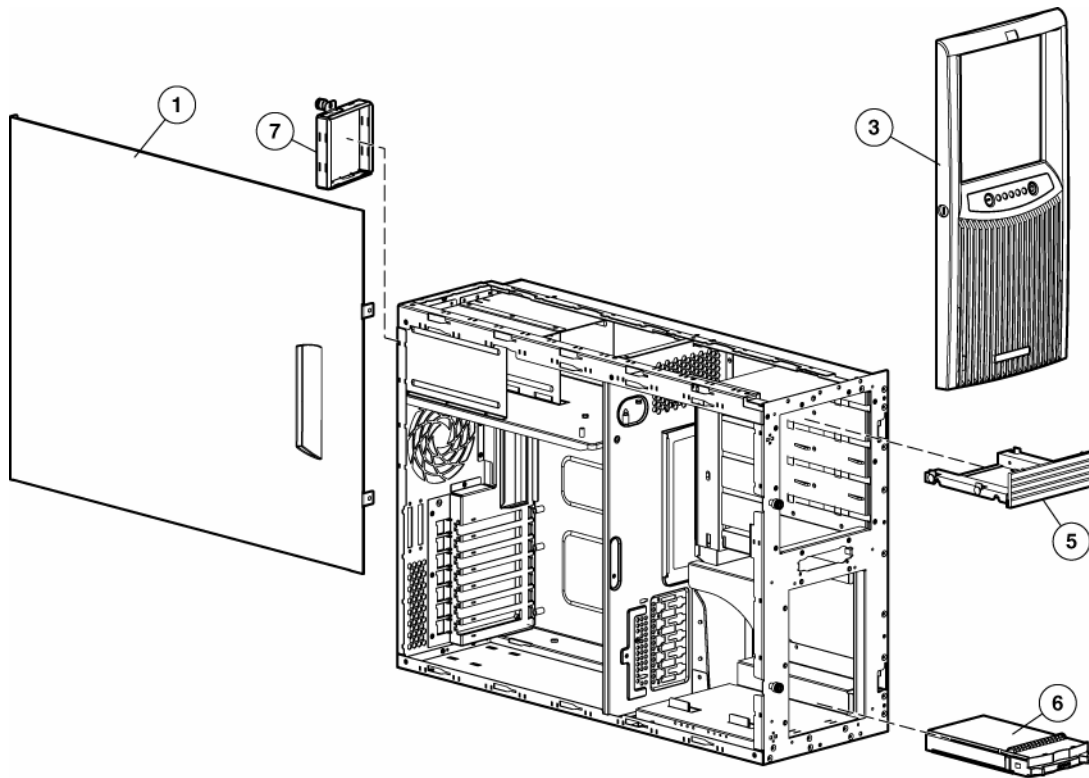
A convenient, easy-to-use program:

- An HP support specialist will diagnose and assess whether a replacement part is required to address a system problem. The specialist will also determine whether you can replace the part.
- Replacement parts are express-shipped. Most in-stock parts are shipped the very same day you contact HP. You may be required to send the defective part back to HP, unless otherwise instructed.
- Available for most HP products currently under warranty or contract. For information on the warranty service, refer to the HP website (<http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html>).

For more information about HP's customer self-repair program, contact your local service provider. For the North American program, refer to the HP website (<http://www.hp.com/go/selfrepair>).

Customer replaceable parts are identified in the following tables.

Mechanical components



Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
1	Access panel, tower	365058-001	—	Yes
2	Access panel, rack*	371714-001	—	Yes
3	Front bezel (tower model)	365064-001 ‡ See requirement	433940-001	Yes
4	Rack bezel*	390545-001 ‡ See requirement	409684-001	Yes
5	Removable media blank	231212-001	—	Yes
6	Hard drive blank	—	—	—
	a) SCSI hard drive blank	319602-001	—	Yes
	b) SATA hard drive blank*	392613-001	—	—
7	Hot-plug power supply blank	365059-001 ‡ See requirement	433942-001	Yes
8	Return kit (tower model)*	339550-001	—	Yes
9	Return kit (rack model)*	290551-001	—	Yes

*Not shown

‡REQUIREMENT:

For Customers in the EU only.

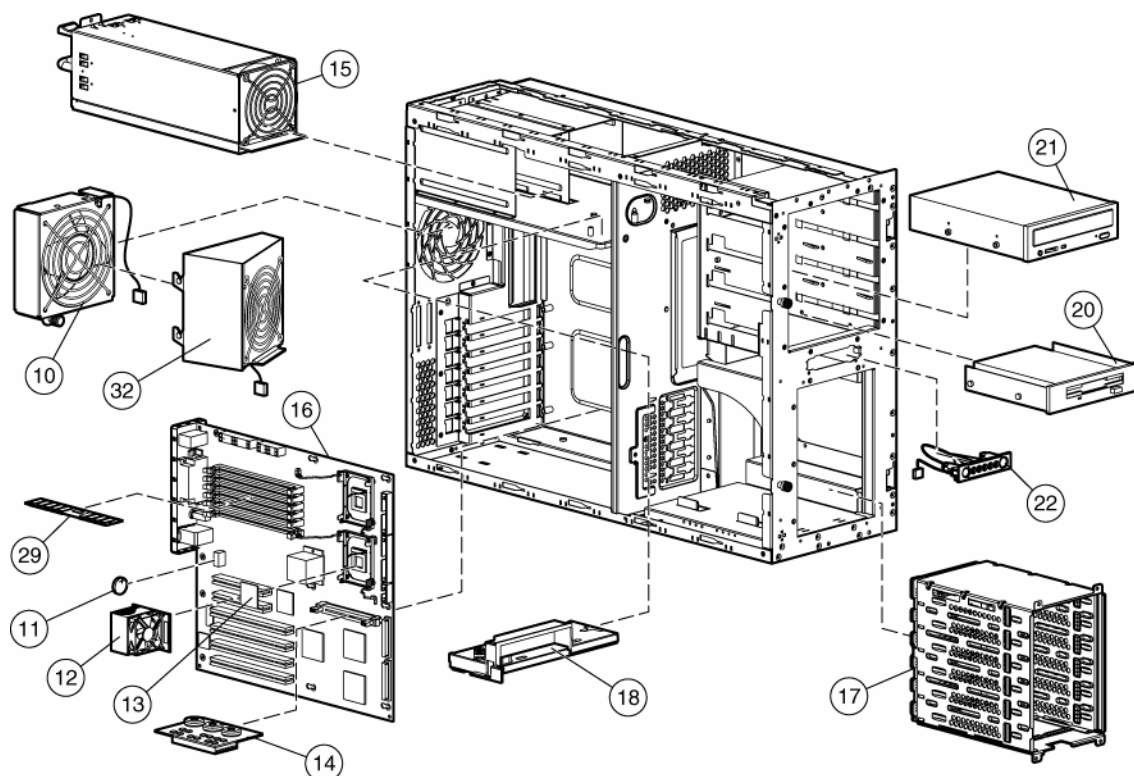
The use of the Original Spare part is regulated by RoHS legislation§.

If your unit contains a part that is labelled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU.

If your unit contains a part that is labelled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.

§Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.

System components



Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
	System components			
10	Fan assembly, 120-mm	367637-001	—	Yes
11	3.0-V lithium battery	234556-001	—	Yes
12	Heatsink	366866-001	—	Yes
13	Processor	—	—	—
	a) Intel® Xeon™ 2.80-GHz, 1MB with 800-MHz system bus	373580-005	—	Yes
	b) Intel® Xeon™ 3.00-GHz, 1MB with 800-MHz system bus*	366864-001	—	Yes
	c) Intel® Xeon™ 3.00-GHz, 2MB with 800-MHz system bus*	383035-001	—	Yes
	d) Intel® Xeon™ 3.20-GHz, 2MB with 800-MHz system bus*	383036-001	—	Yes
	e) Intel® Xeon™ 3.40-GHz, 2MB with 800-MHz system bus*	383037-001	—	Yes

Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
14	Processor power module	347884-001	—	Yes
15	Hot-plug power supply, 725-W, 12-V	390394-001 ‡ See requirement	406413-001	Yes
	Boards			
16	System board	390546-001 ‡ See requirement	409682-001	Yes
17	SCSI hard drive cage with simplex backplane	366862-001	—	Yes
18	Power supply backplane	390548-001 ‡ See requirement	433943-001	Yes
19	SATA/SAS hard drive cage*	390547-001 ‡ See requirement	409683-001	Yes
	Mass storage devices			
20	Diskette drive, 3-mode, 1.44-MB with USB	372058-001 ‡ See requirement	433939-001	Yes
21	CD-ROM drive, IDE, 48X	288894-001	—	Yes
	Miscellaneous			
22	Power switch	292236-001	—	Yes
23	Plastics kit*	250843-001	—	Yes
	Cables			
24	Miscellaneous signal cable kit*	163353-001	—	Yes
25	AC power cable, 3.66-m (12-ft)*	187335-001	—	Yes
26	SCSI cable*	367168-001	—	Yes
27	SCSI point-to-point cable*	292232-001	—	Yes
28	4-port SATA cable*	389950-001	—	Yes
	Memory			
29	DIMM	—	—	—
	a) 512-MB DDR2 DIMM PC2-3200*	359241-001 ‡ See requirement	413384-001	Yes
	b) 1-GB DDR2 DIMM PC2-3200*	359242-001 ‡ See requirement	413385-001	Yes
	c) 2-GB DDR2 DIMM PC2-3200*	359243-001 ‡ See requirement	413386-001	Yes
	d) 2-GB DDR2 DIMM PC2-3200 (dual-rank)*	378021-001 ‡ See requirement	413387-001	Yes
	Options			
30	Two-bay, SCSI hot-plug drive cage*	253761-001	—	Yes
31	Tower-to-rack conversion kit*	366861-001	—	Yes
32	Redundant system fan assembly	372213-001	—	Yes
33	Duplex SCSI backplane*	371722-001	—	Yes
34	Hard drives	—	—	—
	a) 72-GB SCSI Ultra320, 10,000-rpm	404709-001	—	Yes

Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
	b) 146-GB SCSI Ultra320, 10,000-rpm*	404708-001	—	Yes
	c) 300-GB, SCSI Ultra320, 10,000-rpm*	404701-001	—	Yes
	d) 80-GB SATA, 7,200-rpm*	399967-001	—	Yes
	e) 160-GB SATA, 7,200-rpm*	399968-001	—	Yes
	f) 250-GB SATA, 7,200-rpm*	399969-001	—	Yes
35	Second Serial Port*	391183-001 ‡ See requirement	409685-001	Yes
36	Keyboard*	355630-001	—	Yes
37	Mouse*	344704-001	—	Yes

*Not shown

‡REQUIREMENT:

For Customers in the EU only.

The use of the Original Spare part is regulated by RoHS legislation§.

If your unit contains a part that is labelled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU.

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Removal and replacement procedures

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Required tools

You need the following items for some procedures:

- T-15 Torx screwdriver
- Flathead screwdriver
- Diagnostics Utility

Safety considerations

Before performing service procedures, review all the safety information.

Preventing electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Symbols on equipment

The following symbols may be placed on equipment to indicate the presence of potentially hazardous conditions.



This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.



This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.



This symbol on an RJ-45 receptacle indicates a network interface connection.

WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



27.22 kg
60 lb

This symbol indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.



These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.

Rack warnings

- ⚠ WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure that:
- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - The stabilizing feet are attached to the rack if it is a single-rack installation.
 - The racks are coupled together in multiple-rack installations.
 - Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.
- ⚠ WARNING:** To reduce the risk of personal injury or equipment damage when unloading a rack:
- At least two people are needed to safely unload the rack from the pallet. An empty 42U rack can weigh as much as 115 kg (253 lb), can stand more than 2.1 m (7 ft) tall, and may become unstable when being moved on its casters.
 - Never stand in front of the rack when it is rolling down the ramp from the pallet. Always handle the rack from both sides.
- ⚠ WARNING:** To reduce the risk of personal injury or damage to the equipment, adequately stabilize the rack before extending a component outside the rack. Extend only one component at a time. A rack may become unstable if more than one component is extended.
- ⚠ WARNING:** When installing a server in a telco rack, be sure that the rack frame is adequately secured to the top and bottom of the building structure.

Preparation procedures

To access some components and perform certain service procedures, you must perform one or more of the following procedures:

- Extend the server from the rack ("Extending the server from the rack" on page 13).
If you are performing service procedures in a Compaq branded rack, telco rack, or third-party rack cabinet, you can use the locking feature of the rack rails to support the server and gain access to internal components.
For more information about telco rack solutions, refer to the RackSolutions.com website (<http://www.racksolutions.com/hp>).
- Power down the server ("Powering down the server" on page 13).
If you must remove a server from a rack or a non-hot-plug component from a server, power down the server.
- Remove the server from the rack ("Removing the server from the rack" on page 14).
If the rack environment, cabling configuration, or the server location in the rack creates awkward conditions, remove the server from the rack.

Extending the server from the rack

1. Loosen the thumbscrews that secure the server faceplate to the front of the rack.



IMPORTANT: If the server is installed in a telco rack, remove the server from the rack to access internal components.

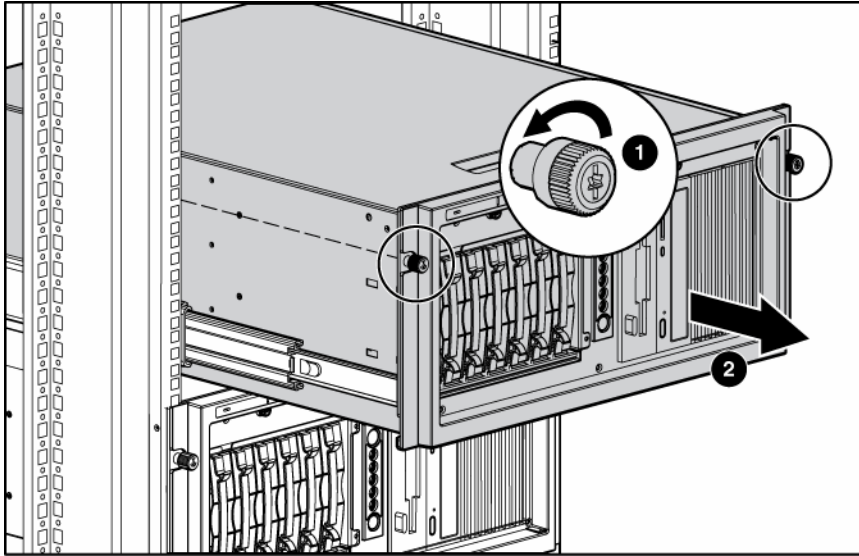
2. Extend the server on the rack rails until the server rail-release latches engage.



WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.



WARNING: To reduce the risk of personal injury, be careful when pressing the server rail-release latches and sliding the server into the rack. The sliding rails could pinch your fingers.



3. After performing the installation or maintenance procedure, slide the server back into the rack:
 - a. Press the server rail-release latches and slide the server fully into rack.
 - b. Secure the server by tightening the thumbscrews.

Powering down the server



WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.



IMPORTANT: If installing a hot-plug device, it is not necessary to power down the server.

1. Shut down the operating system as directed by the operating system documentation.
2. Press the Power On/Standby button to place the server in standby mode. When the server activates standby power mode, the system power LED changes to amber.
3. Disconnect the power cords.

The system is now without power.



CAUTION: Due to the high capacitance in the power supply, always wait 30 seconds after disconnecting the power cord before removing the access panel.

Removing the server from the rack

To remove the server from an HP, telco, or third-party rack:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Loosen the front panel thumbscrews that secure the server faceplate to the front of the rack.
3. Disconnect the cabling and remove the server from the rack. Reverse the server installation steps in the documentation that ships with the rack-mounting option.
4. Place the server on a sturdy, level surface.

Access panel

⚠ CAUTION: Due to the high capacitance in the power supply, always wait 30 seconds after disconnecting the power cord before removing the access panel.

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - a. Remove the server from the rack, if applicable ("[Removing the server from the rack](#)" on page 14).
 - b. Remove the tower front bezel, if applicable ("[Front bezel \(tower model\)](#)" on page 15).
3. Loosen the two thumbscrews on the front panel of the server near the access panel.
4. Slide the access panel back about 1.5 cm (0.5 in).
5. Lift and remove the access panel.

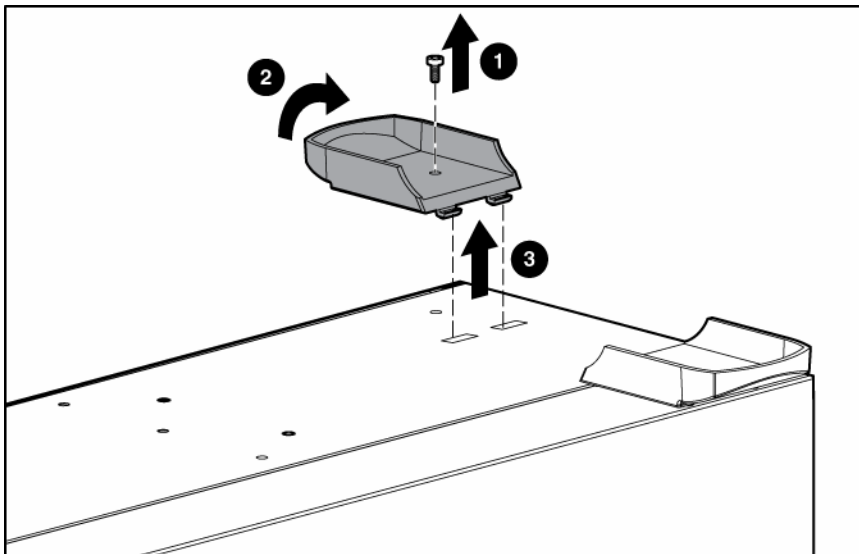


NOTE: Turn the access panel over to locate the hood labels. These labels provide information on installing various options, flexible memory configurations, LED status indicators, and switch settings.

To replace the component, reverse the removal procedure.

Tower feet

Remove the feet.



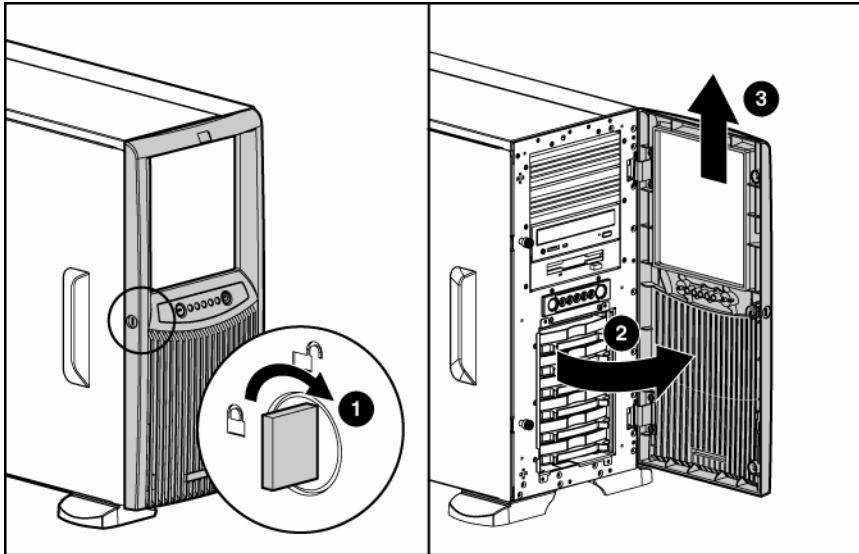
To replace the component, reverse the removal procedure.

Front bezel (tower model)


This server has a removable front bezel that must be unlocked and opened before accessing the hard drive cage or removing the access panel. The door should be kept closed during normal server operations.

Use the key provided with the server to unlock the bezel with a clockwise turn.

If necessary, remove the front bezel.



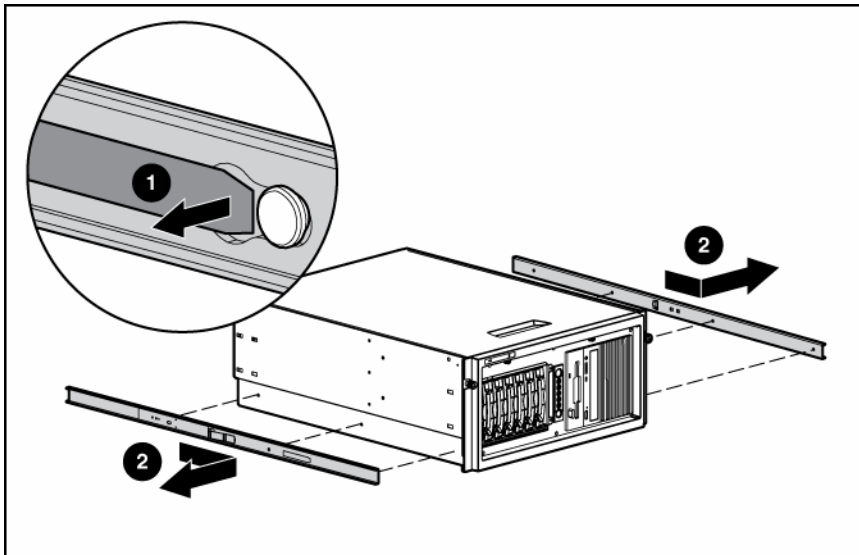
Rack rails

 **NOTE:** This procedure applies to rack servers only.

To remove the component:

1. Use a flat-head screwdriver to lift the spring tab.

2. Slide the rail forward and remove it from the server.



3. Repeat steps 1 and 2 to remove other rail.

To replace the component, reverse the removal procedure.

Power supply blank

Loosen the thumbscrew that secures the redundant power supply blank, and then pull the blank from the back of the server.

Hot-plug power supply

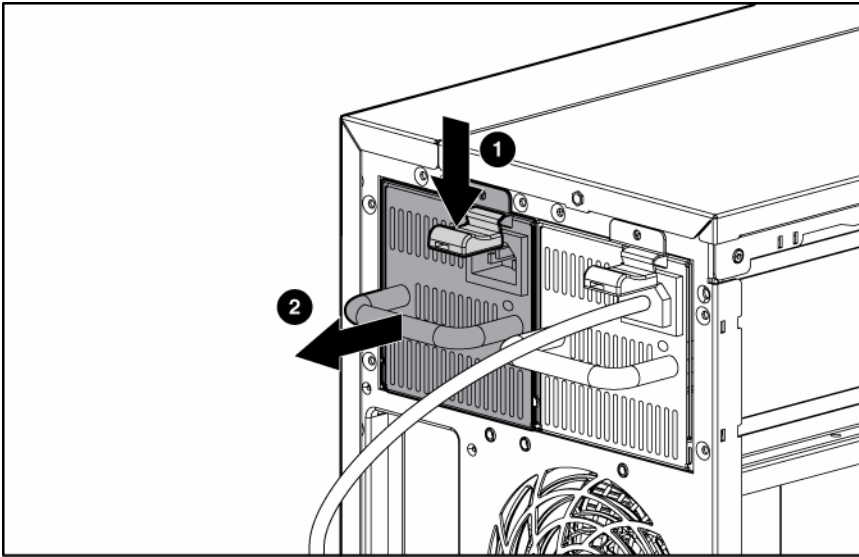
⚠ WARNING: To reduce the risk of electric shock, do not disassemble the power supply or attempt to repair it. Replace it only with the specified spare part.

⚠ CAUTION: Do not attempt to remove and replace a power supply as a hot-plug procedure unless both bays are populated with power supplies.

To remove the component:

1. Remove the power cord from the unit to be removed.

2. Push down on the power supply release latch, and remove the power supply from the server.



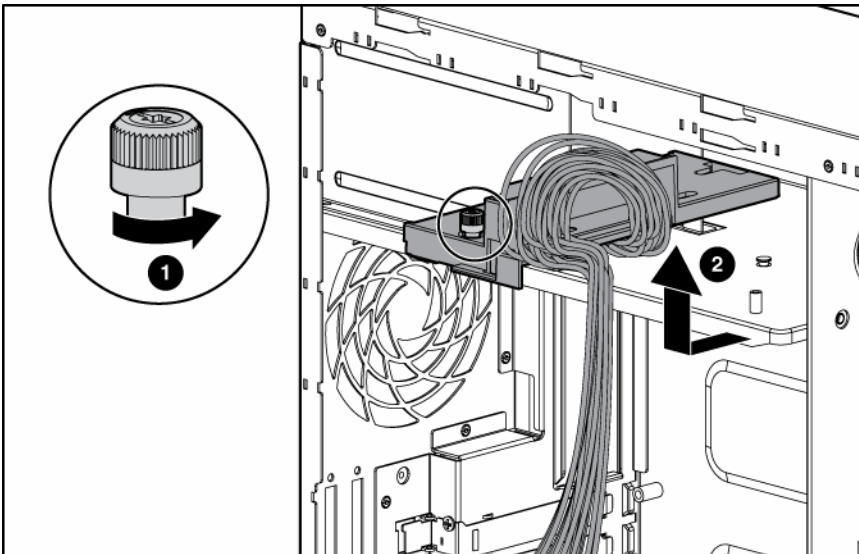
CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To replace the component, reverse the removal procedure.

Hot-plug power supply backplane

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Remove the power supplies from the server ("[Hot-plug power supply](#)" on page 16).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Disconnect the cables from the components connected to the power supply backplane.
5. Remove the power supply backplane.



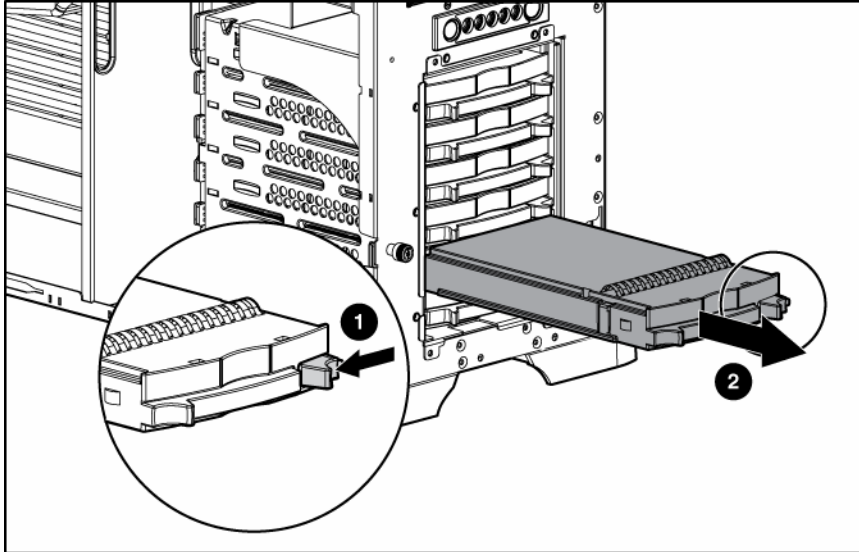
To replace the component, reverse the removal procedure.

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

SCSI hard drive blanks

To remove the component:

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.



NOTE: Depending on model purchased, the server may look slightly different than shown.

To replace the component, reverse the removal procedure.

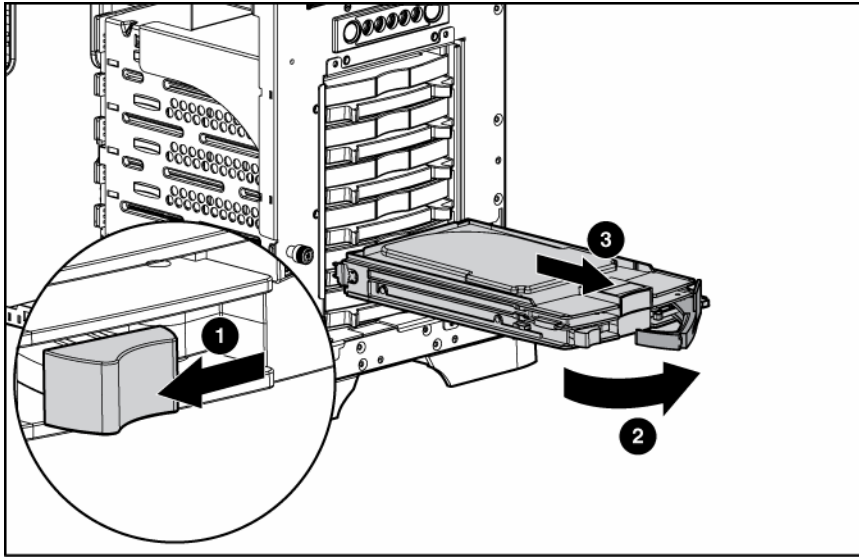
Hot-plug SCSI hard drives

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To remove the component:

1. Open the front bezel ("[Front bezel \(tower model\)](#)" on page [15](#)).
2. Determine the status of the hard drive from the hot-plug hard drive LEDs ("[Hot-plug SCSI hard drive LEDs](#)" on page [49](#)).
3. Back up all server data on the hard drive.

4. Remove the hard drive.



To replace the component, reverse the procedure.

Hot-plug SATA and SAS hard drives

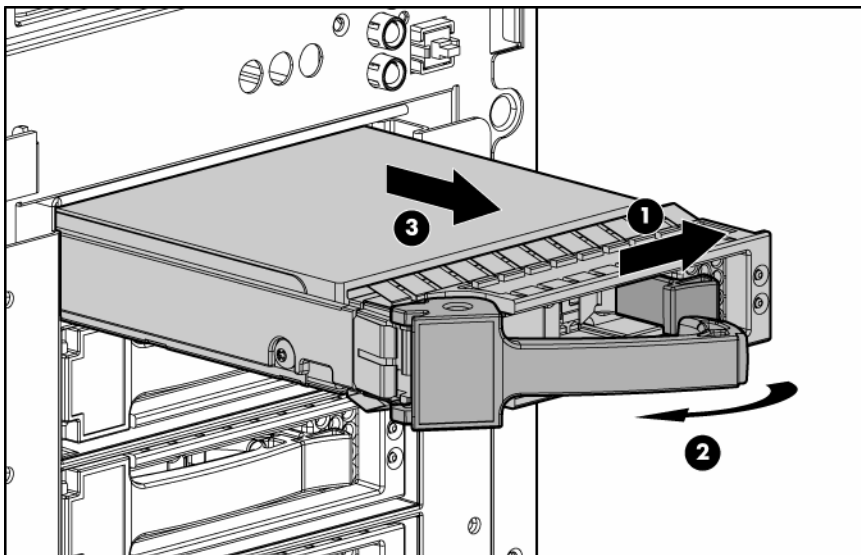
Hot-plug SATA and hot-plug SAS hard drives can be used interchangeably when a SAS controller is installed. Before installing a SAS hard drive, you must install a SAS controller. A SATA controller is embedded for use with SATA drives only.

To remove the component:

⚠ CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

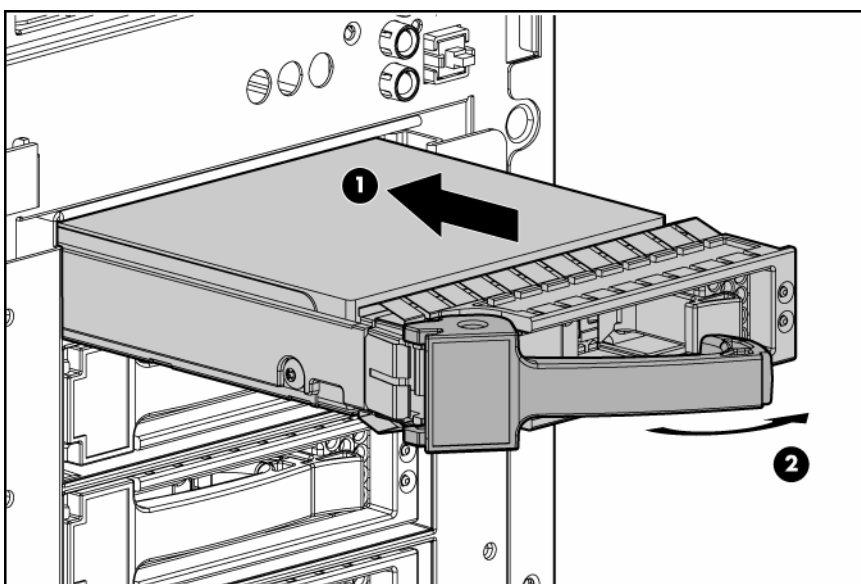
1. Open the front bezel ("[Front bezel \(tower model\)](#)" on page 15).
2. Determine the status of the hard drive:
 - a. when using the embedded SATA controller, observe the OS logs or the status in POST
 - b. when using an optional SATA/SAS controller, observe the hot-plug hard drive LEDs ("[SATA or SAS hard drive LEDs](#)" on page 50)
3. Back up all server data on the hard drive.
4. Disconnect the cables from the hot-plug SATA/SAS drive cage.

5. Remove the hard drive.



To replace the component:

1. Remove the existing hard drive blank or hard drive from the drive bay.
2. Install the hard drive.



3. Determine the status of the hard drive from the hot-plug hard drive LEDs ("Hot-plug SCSI hard drive LEDs" on page 49).
4. Resume normal server operations.

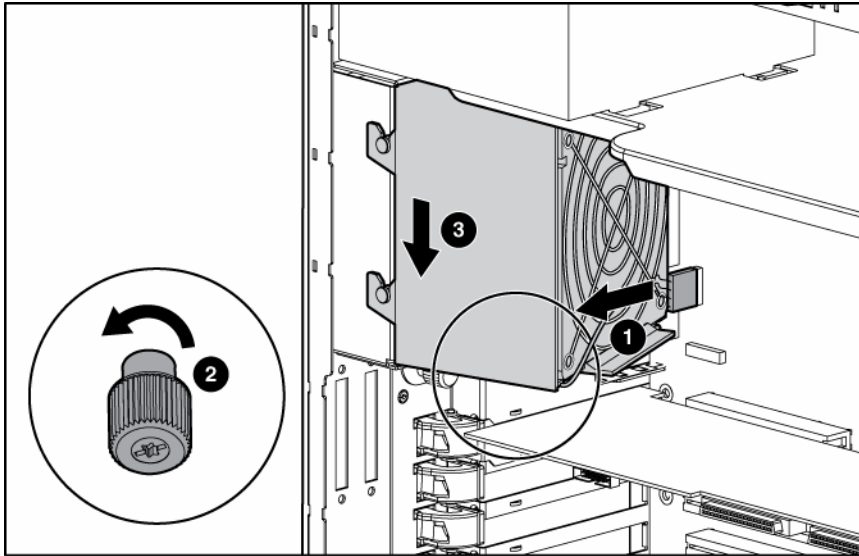
Redundant system fan

CAUTION: The redundant system fan is not hot-pluggable.

To remove the redundant system fan:

1. Power down the server ("Powering down the server" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("Front bezel (tower model)" on page 15).

- Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
 4. Disconnect the redundant system fan cable from the redundant system fan connector on the system board.
 5. Remove the fan.



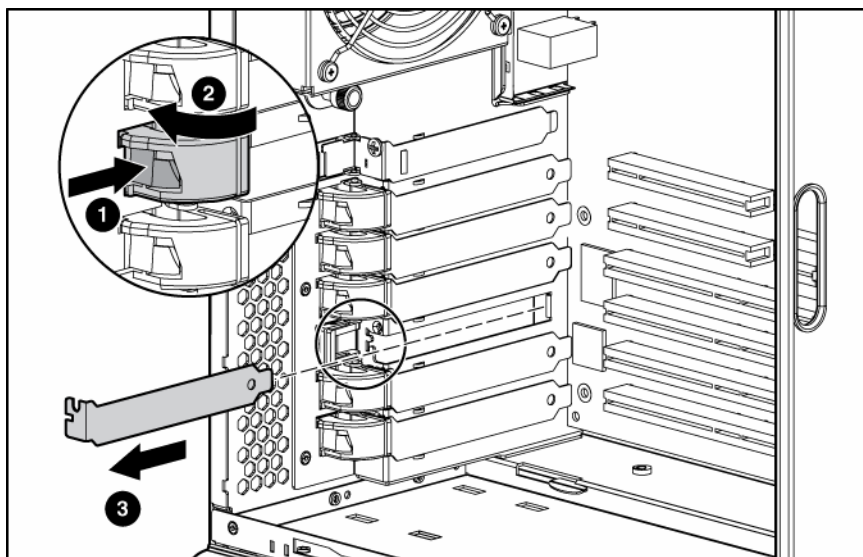
To replace the component, reverse the removal procedure.

Expansion slot cover

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).

4. Remove the expansion slot cover.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

To replace the component, reverse the removal procedure.

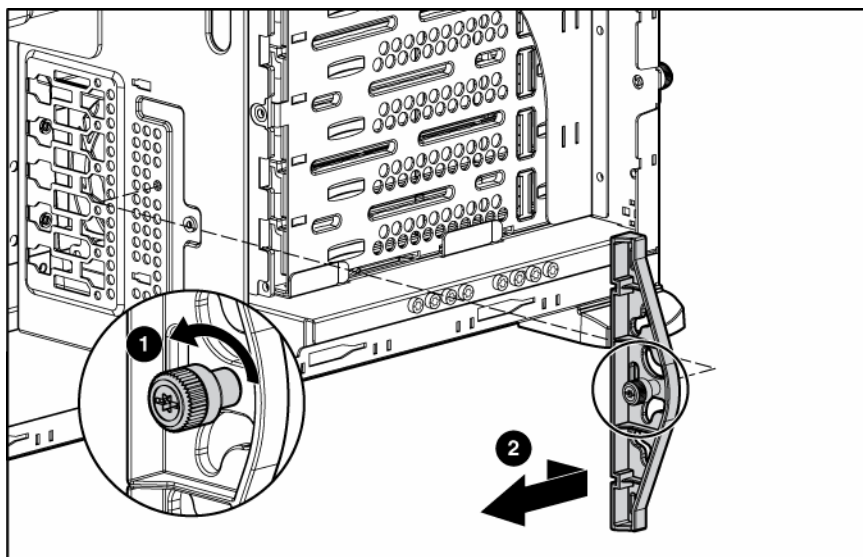
Expansion board

CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the expansion boards.

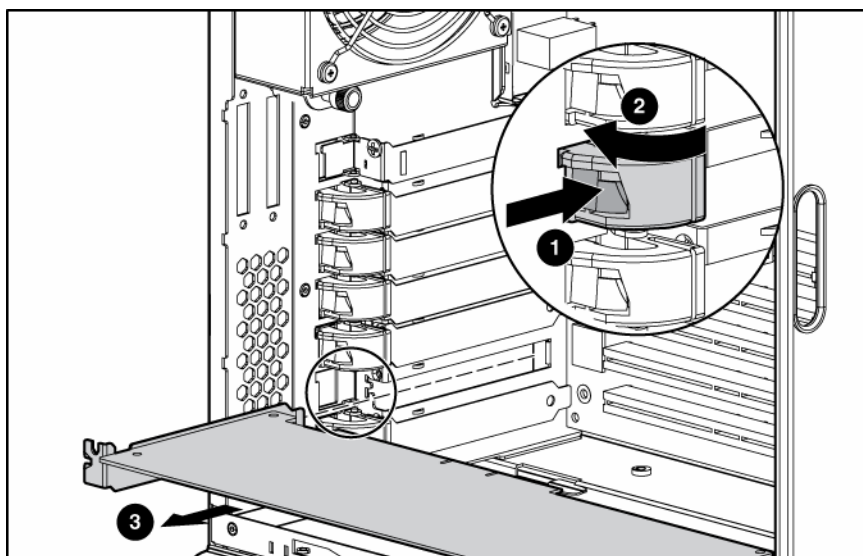
To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).

4. Remove the expansion board retainer.



5. Disconnect any internal or external cables from the expansion board.
6. Remove the expansion board.



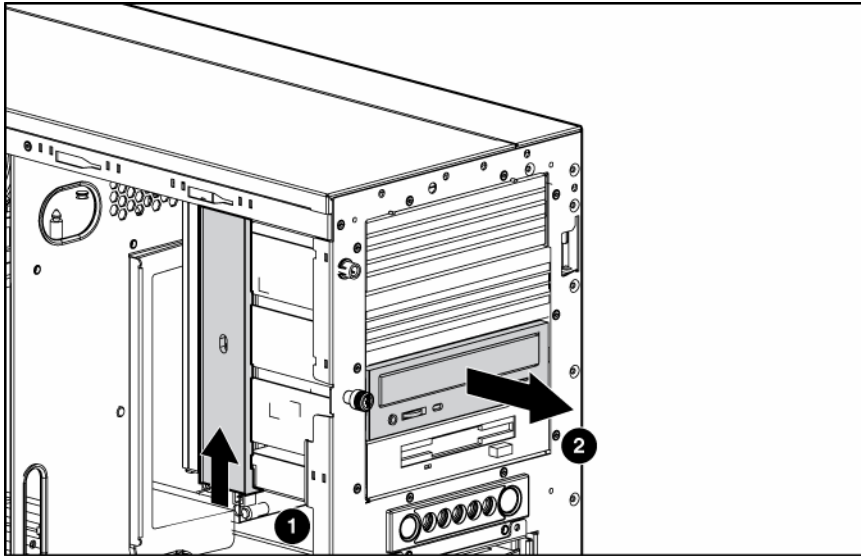
7. Reinstall the expansion board retainer, then tighten the thumbscrew.
- To replace the component, reverse the removal procedure.

Half-height media device

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Disconnect the cables from the rear of the media device.

5. Push up on the release lever and push the drive partially out through the front of the server.
6. Remove the media device.

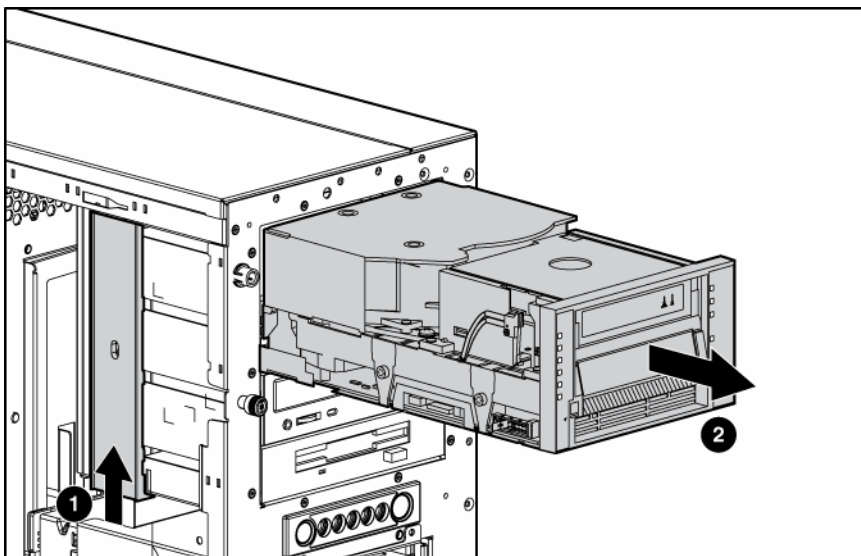


To replace the component, reverse the removal procedure.

Tape drive

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Disconnect the data and power cables from the rear of the tape drive.
5. Push up on the release lever and push the drive partially out through the front of the server.
6. Remove the tape drive.



To replace the component, reverse the removal procedure.

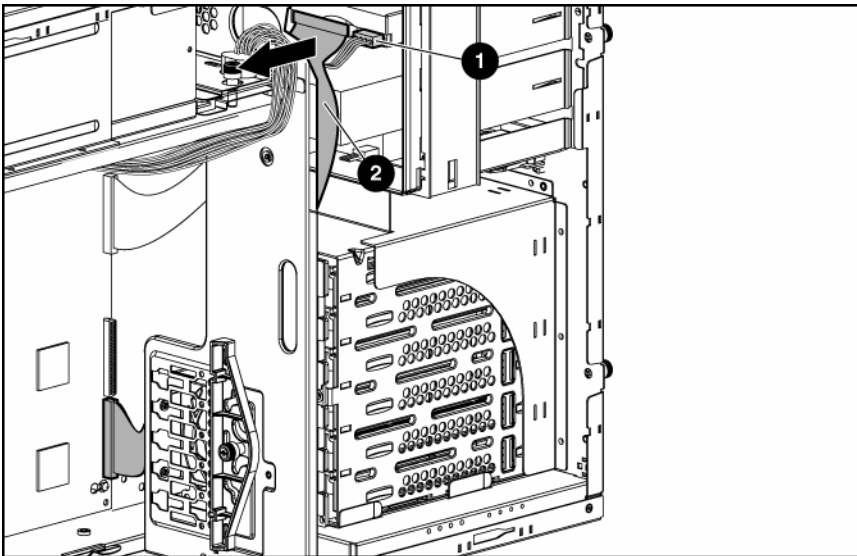


IMPORTANT: HP recommends installing the tape drive on a separate SCSI cable to avoid a decrease in performance on other SCSI devices.

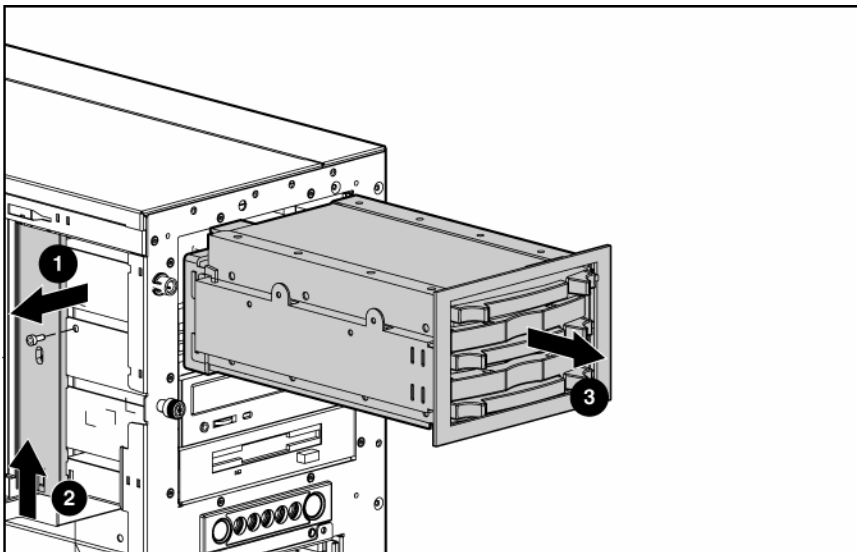
Internal two-bay hot-plug SCSI drive cage

To remove the component:

1. Power down the server ("Powering down the server" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("Front bezel (tower model)" on page 15).
 - Extend the server from the rack ("Extending the server from the rack" on page 13).
3. Remove the access panel ("Access panel" on page 14).
4. Access the removable media cage.
5. Disconnect the SCSI and power cables.



6. Remove the drive cage from the chassis.



To replace the component, reverse the removal procedure.



IMPORTANT: Be sure that the unit identification numbers (0 and 1) appear on the right side of the drive cage front panel.

Refer to the *HP Internal Two-Bay Hot-Plug SCSI Drive Cage Installation Instructions* for additional information.

Processor and heatsink



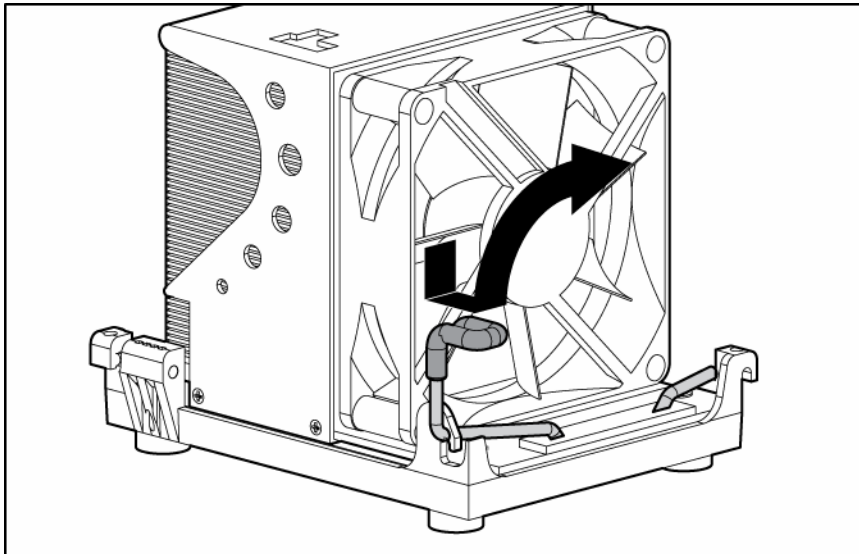
IMPORTANT: If upgrading processor speed, update the system ROM before installing the processor.



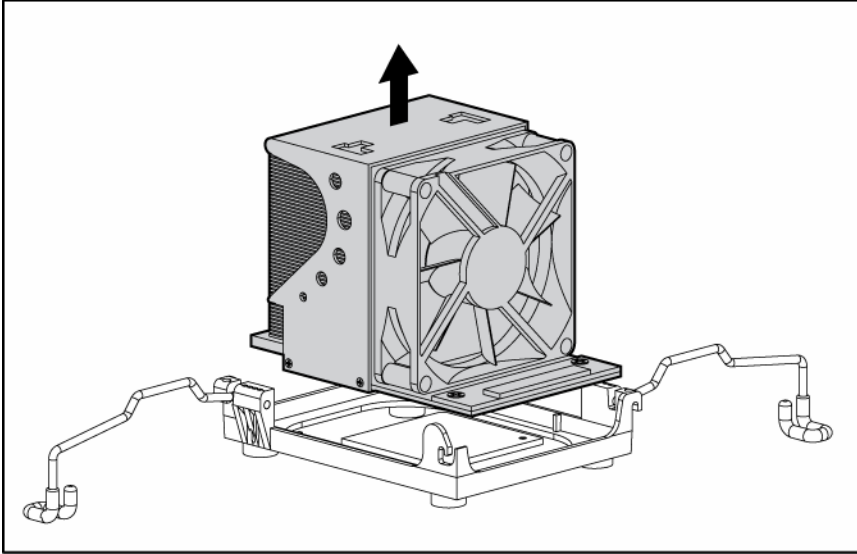
IMPORTANT: PPM 2 must be installed when processor 2 is installed. The system fails to boot if the PPM is missing.

To remove a processor and heatsink:

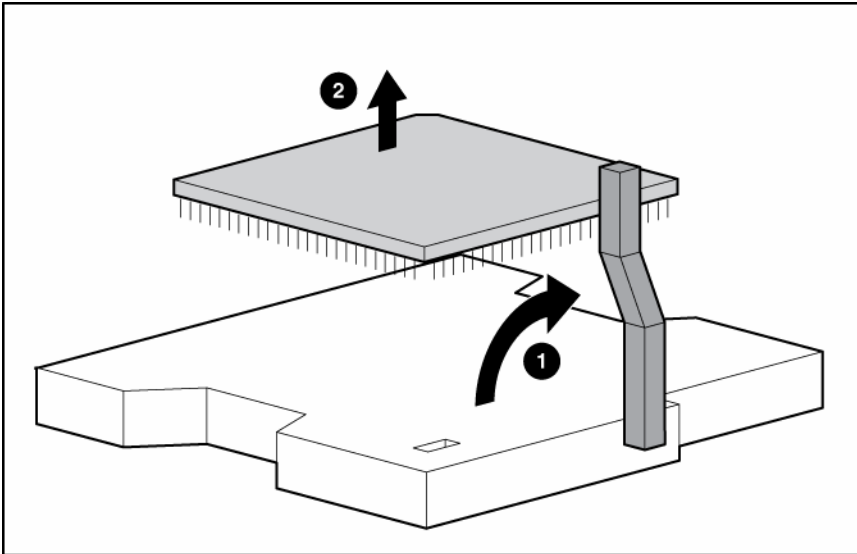
1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Disconnect the heatsink fan cable from the heatsink connectors on the system board.
5. Open the heatsink retaining levers.



6. Remove the heatsink.



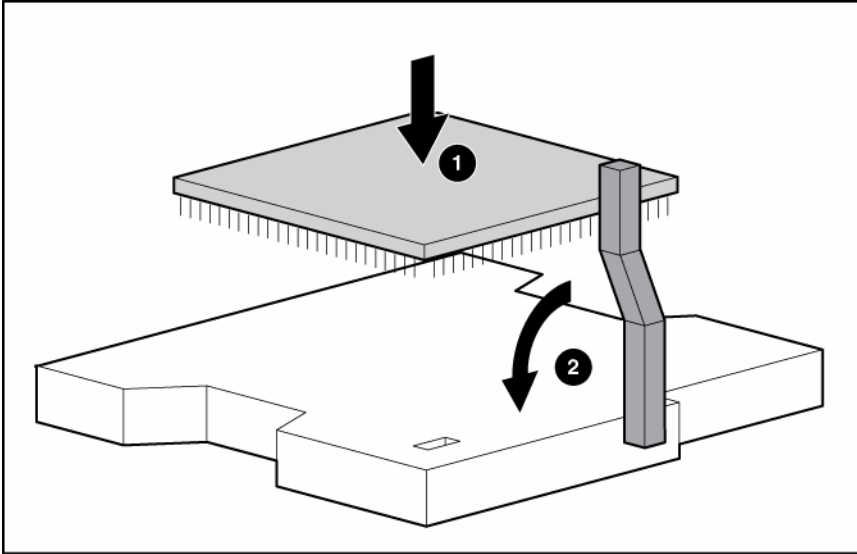
7. Open the processor locking lever and remove the processor.



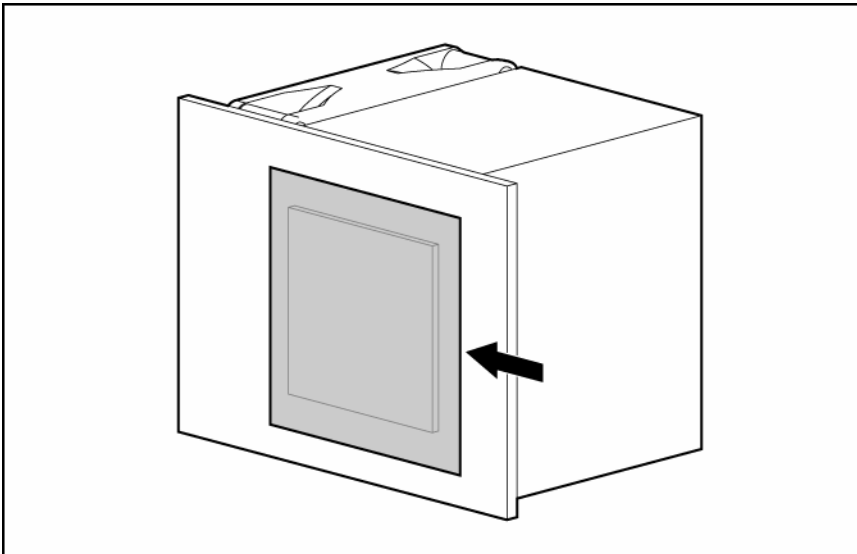
To replace the processor and heatsink:

1. Open the processor locking lever, if necessary.
2. Install the processor and close the processor locking lever.

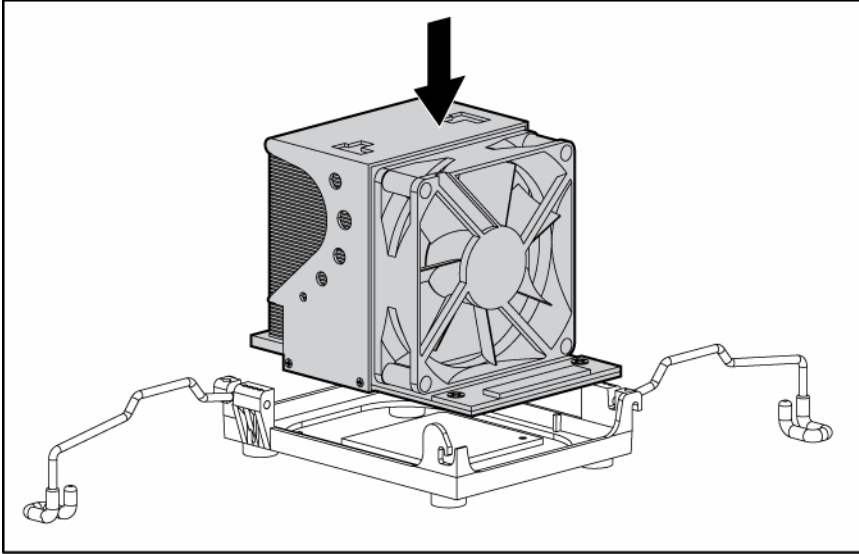
⚠ CAUTION: Forcing the processor locking lever could lead to hardware damage.



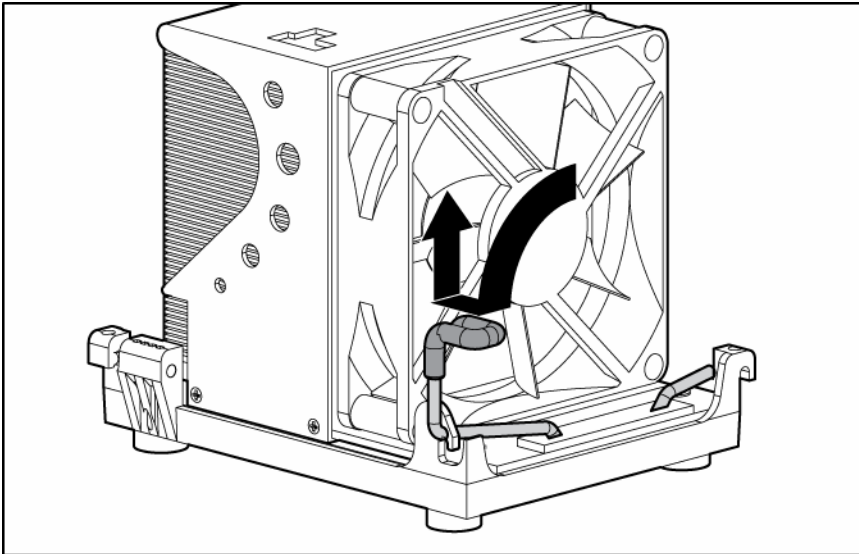
📌 IMPORTANT: Do not remove the thermal tape from the bottom of the heatsink. Removing the tape will affect the thermal solution and prevent the system from working properly.



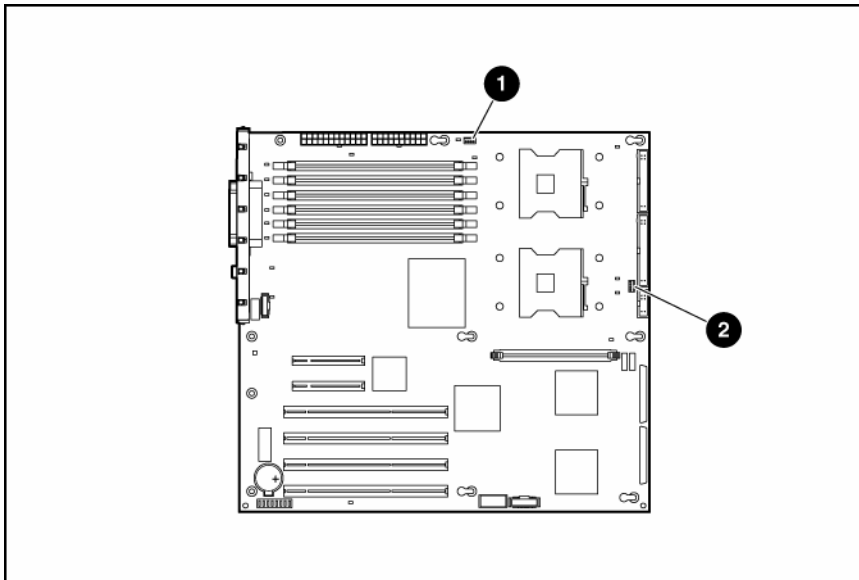
3. Install the heatsink.



4. Close the processor retaining brackets.



5. Connect the heatsink fan cable to the connector on the system board.



Item	Description
1	Processor 1 heatsink fan connector
2	Processor 2 heatsink fan connector

6. Install the access panel.

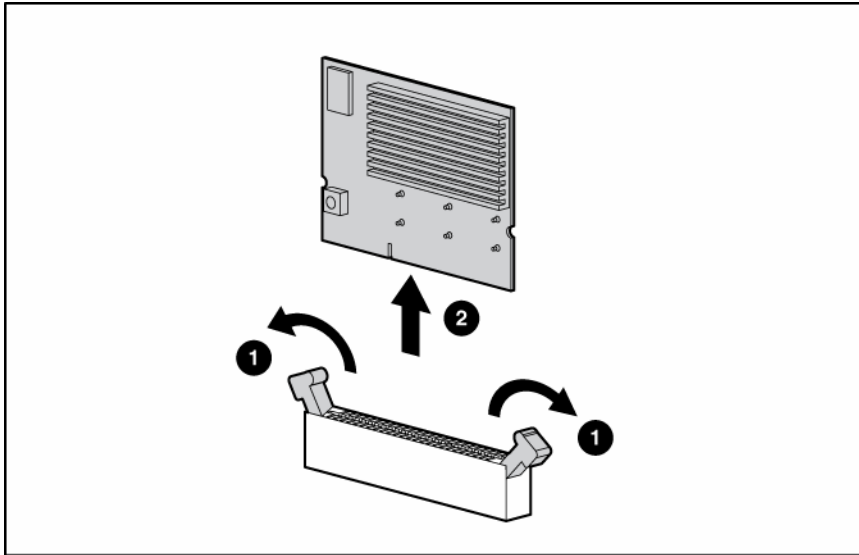
PPM

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Open the latches on the PPM slot.
5. Remove the PPM for processor 2 (if a second processor is installed).



NOTE: PPM 1 is embedded in the system board.

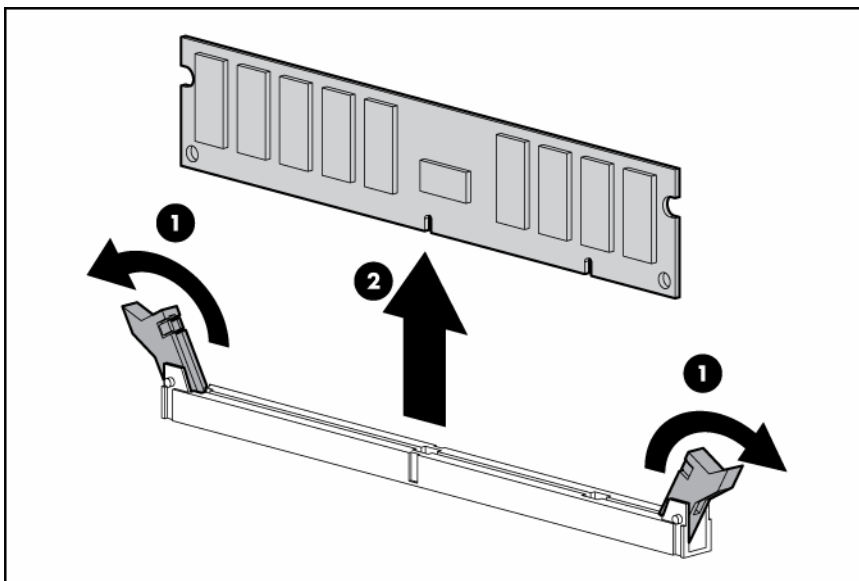


NOTE: The appearance of compatible PPMs may vary.

To replace the component, reverse the removal procedure.

DIMM

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Open the DIMM slot latches.
5. Remove the DIMM.

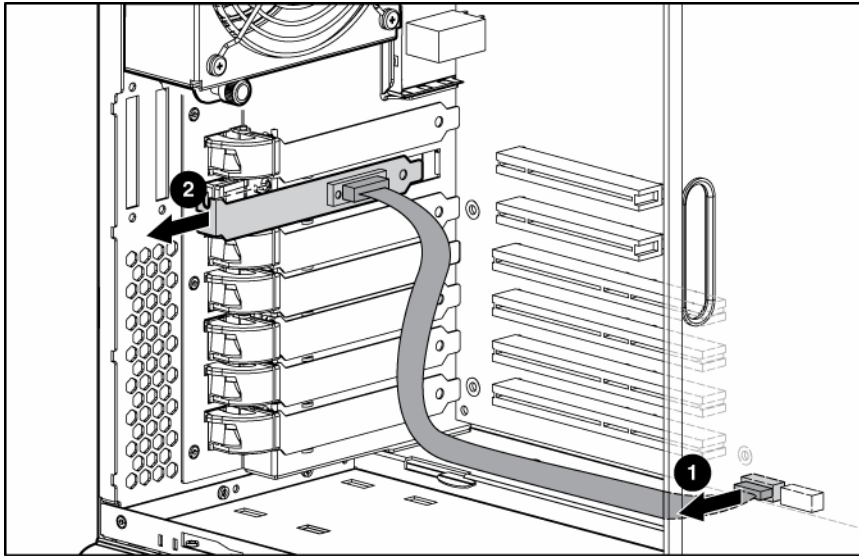


To replace the component, reverse the removal procedure.

Second serial port

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Open the retention clip securing the second serial port.
5. Remove the serial port cable from the serial port header on the system board.
6. Remove the second serial port option.



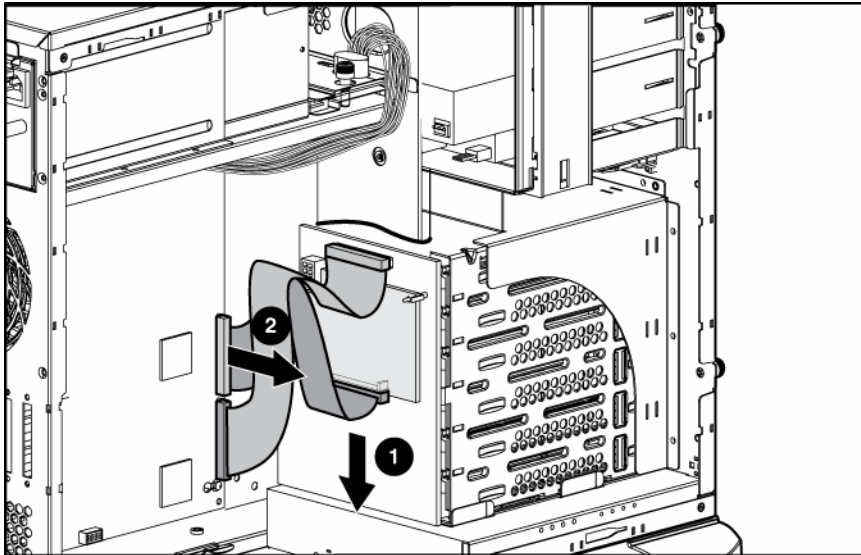
To replace the component, reverse the removal procedure.

Duplex SCSI backplane

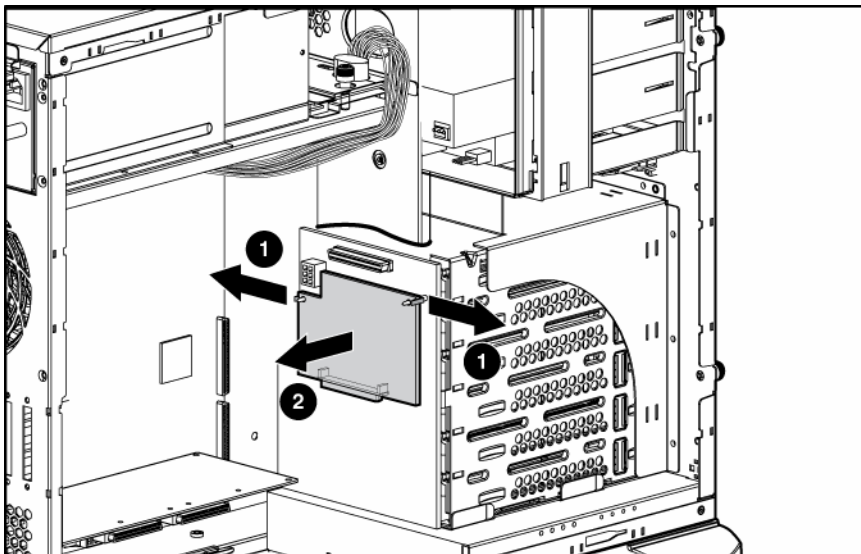
To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).

4. Remove the SCSI cable from the duplex SCSI backplane and from either the array controller or the system board.



5. Remove the duplex SCSI backplane.



To replace the component, reverse the removal procedure.

Battery

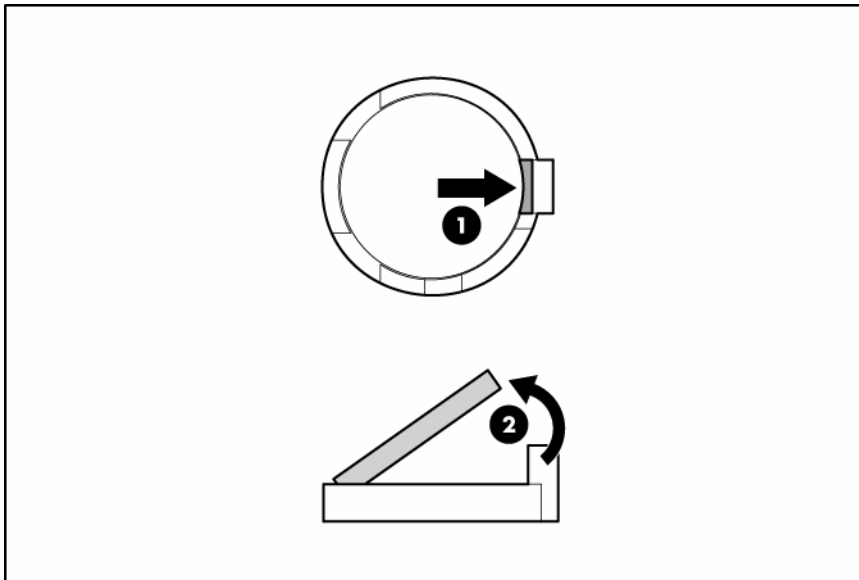
If the server no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.

⚠ WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- **Do not attempt to recharge the battery.**
- **Do not expose the battery to temperatures higher than 60°C (140°F).**
- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**
- **Replace only with the spare designated for this product.**

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Remove the battery.



IMPORTANT: Replacing the system board battery resets the system ROM to its default configuration. After replacing the battery, reconfigure the system through RBSU.

To replace the component, reverse the removal procedure.

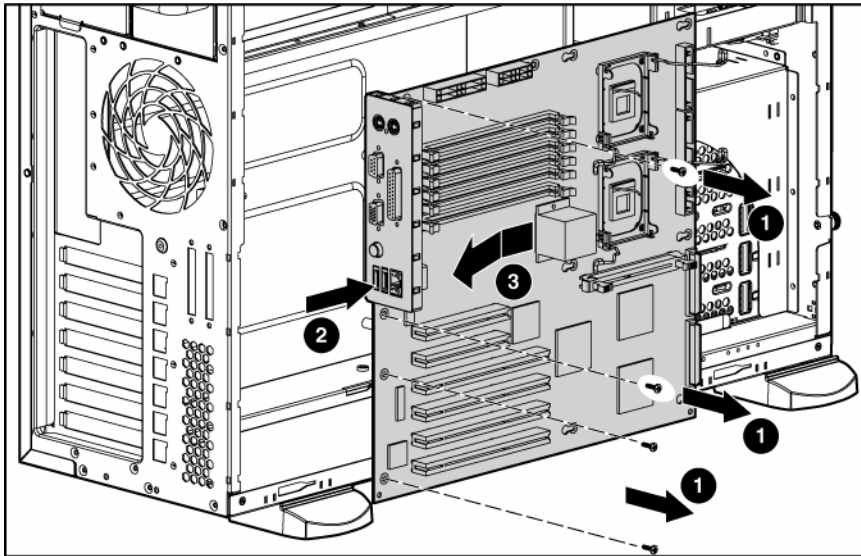
For more information about battery replacement or proper disposal, contact an authorized reseller or an authorized service provider.

System board

To remove the component:

1. Power down the server ("[Powering down the server](#)" on page 13).
2. Do one of the following:
 - Unlock and remove the bezel ("[Front bezel \(tower model\)](#)" on page 15).
 - Extend the server from the rack ("[Extending the server from the rack](#)" on page 13).
3. Remove the access panel ("[Access panel](#)" on page 14).
4. Remove the system fans ("[Redundant system fan](#)" on page 20).
5. Remove the processors and heatsinks ("[Processor and heatsink](#)" on page 26).
6. Remove all DIMMs ("[DIMM](#)" on page 31).

7. Remove all expansion boards ("Expansion board" on page 22).
8. Remove the PPM for processor 2 ("PPM" on page 30).
9. Disconnect all cables connected to the system board.
10. Remove the four system board screws, and remove the system board.



To replace the component, reverse the removal procedure.

Server serial number and product ID

After you replace the system board, you must re-enter the server serial number and the product ID.

1. During the server startup sequence, press the **F9** key to access RBSU.
2. Select the **System Options** menu.
3. Select **Serial Number**. The following warning is displayed:
 WARNING! WARNING! WARNING! The serial number is loaded into the system during the manufacturing process and should NOT be modified. This option should only be used by qualified service personnel. This value should always match the serial number sticker located on the chassis.
4. Press the **Enter** key to clear the warning.
5. Enter the serial number and press the **Enter** key.
6. Select **Product ID**.
7. Enter the product ID and press the **Enter** key.
8. Press the **Esc** key to close the menu.
9. Press the **Esc** key to exit RBSU.

Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

Diagnostic tools

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Integrated Management Log	37
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Troubleshooting resources

The *HP ProLiant Servers Troubleshooting Guide* provides simple procedures for resolving common problems as well as a comprehensive course of action for fault isolation and identification, error message interpretation, issue resolution, and software maintenance.

To obtain the guide, refer to any of the following sources and then select the *HP ProLiant Servers Troubleshooting Guide*:

- The server-specific Documentation CD
- The Business Support Center on the HP website (<http://www.hp.com/support>). Navigate to the server technical support page. Under self-help resources, select **ProLiant Troubleshooting Guide**.
- The Technical Documentation website (<http://www.docs.hp.com>). Select **Enterprise Servers, Workstations and Systems Hardware**, and then the appropriate server.

Automatic Server Recovery

ASR is a feature that causes the system to restart when a catastrophic operating system error occurs, such as a blue screen, ABEND, or panic. A system fail-safe timer, the ASR timer, starts when the System Management driver, also known as the Health Driver, is loaded. When the operating system is functioning properly, the system periodically resets the timer. However, when the operating system fails, the timer expires and restarts the server.

ASR increases server availability by restarting the server within a specified time after a system hang or shutdown. At the same time, the HP SIM console notifies you by sending a message to a designated pager number that ASR has restarted the system. You can disable ASR from the HP SIM console or through RBSU.

HP Systems Insight Manager

HP SIM is a web-based application that allows system administrators to accomplish normal administrative tasks from any remote location, using a web browser. HP SIM provides device management capabilities that consolidate and integrate management data from HP and third-party devices.



IMPORTANT: You must install and use HP SIM to benefit from the Pre-Failure Warranty for processors, SAS and SCSI hard drives, and memory modules.

For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP SIM website (<http://www.hp.com/go/hpsim>).

HP Instant Support Enterprise Edition

ISEE is a proactive remote monitoring and diagnostic tool to help manage your systems and devices, a feature of HP support. ISEE provides continuous hardware event monitoring and automated notification to identify and prevent potential critical problems. Through remote diagnostic scripts and vital system configuration information collected about your systems, ISEE enables fast restoration of your systems. Install ISEE on your systems to help mitigate risk and prevent potential critical problems.

For more information on ISEE, refer to the HP website (http://www.hp.com/hps/hardware/hw_enterprise.html).

To download HP ISEE, visit the HP website (http://www.hp.com/hps/hardware/hw_downloads.html).

For installation information, refer to the HP ISEE Client Installation and Upgrade Guide (ftp://ftp.hp.com/pub/services/hardware/info/isee_client.pdf).

Integrated Management Log

The IML records hundreds of events and stores them in an easy-to-view form. The IML timestamps each event with 1-minute granularity.

You can view recorded events in the IML in several ways, including the following:

- From within HP SIM ("HP Systems Insight Manager" on page 37)
- From within Survey Utility
- From within operating system-specific IML viewers
 - For NetWare: IML Viewer
 - For Windows®: IML Viewer
 - For Linux: IML Viewer Application
- From within the RILOE user interface
- From within HP Insight Diagnostics (on page 39)

For more information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack.

Option ROM Configuration for Arrays

Before installing an operating system, you can use the ORCA utility to create the first logical drive, assign RAID levels, and establish online spare configurations.

The utility also provides support for the following functions:

- Reconfiguring one or more logical drives

- Viewing the current logical drive configuration
- Deleting a logical drive configuration
- Setting the controller to be the boot controller

If you do not use the utility, ORCA will default to the standard configuration.

For more information regarding array controller configuration, refer to the controller user guide.

For more information regarding the default configurations that ORCA uses, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD.

HP ProLiant Essentials Rapid Deployment Pack

The RDP software is the preferred method for rapid, high-volume server deployments. The RDP software integrates two powerful products: Altiris Deployment Solution and the HP ProLiant Integration Module.

The intuitive graphical user interface of the Altiris Deployment Solution console provides simplified point-and-click and drag-and-drop operations that enable you to deploy target servers, including server blades, remotely. It enables you to perform imaging or scripting functions and maintain software images.

For more information about the RDP, refer to the HP ProLiant Essentials Rapid Deployment Pack CD or refer to the HP website (<http://www.hp.com/servers/rdp>).

ROM-Based Setup Utility

RBSU, an embedded configuration utility, performs a wide range of configuration activities that may include:

- Configuring system devices and installed options
- Displaying system information
- Selecting the primary boot controller

For more information on RBSU, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD or the HP website (<http://www.hp.com/servers/smartstart>).

ROMPaq utility

Flash ROM enables you to upgrade the firmware (BIOS) with system or option ROMPaq utilities. To upgrade the BIOS, insert a ROMPaq diskette into the diskette drive and boot the system.

The ROMPaq utility checks the system and provides a choice (if more than one exists) of available ROM revisions. This procedure is the same for both system and option ROMPaq utilities.

For more information about the ROMPaq utility, refer to the HP website (<http://www.hp.com/servers/manage>).

System online ROM flash component utility

The Online ROM Flash Component Utility enables system administrators to efficiently upgrade system or controller ROM images across a wide range of servers and array controllers. This tool has the following features:

- Works offline and online
- Supports Microsoft®, Windows® 2000, Windows Server™ 2003, Novell Netware, and Linux operating systems



IMPORTANT: This utility supports operating systems that may not be supported by the server. For operating systems supported by the server, refer to the HP website (<http://www.hp.com/go/supportos>).

- Integrates with other software maintenance, deployment, and operating system tools
- Automatically checks for hardware, firmware, and operating system dependencies, and installs only the correct ROM upgrades required by each target server

To download the tool and for more information, refer to the HP website (<http://h18000.www1.hp.com/support/files/index.html>).

SmartStart software

SmartStart is a collection of software that optimizes single-server setup, providing a simple and consistent way to deploy server configuration. SmartStart has been tested on many ProLiant server products, resulting in proven, reliable configurations.

SmartStart assists the deployment process by performing a wide range of configuration activities, including:

- Configuring hardware using embedded configuration utilities, such as RBSU and ORCA
- Preparing the system for installing "off-the-shelf" versions of leading operating system software
- Installing optimized server drivers, management agents, and utilities automatically with every assisted installation
- Testing server hardware using the Insight Diagnostics Utility ("HP Insight Diagnostics" on page 39)
- Installing software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu provides access to a complete list of ProLiant system software.
- Enabling access to the Array Configuration Utility, Array Diagnostic Utility, and Erase Utility

SmartStart is included in the HP ProLiant Essentials Foundation Pack. For more information about SmartStart software, refer to the HP ProLiant Essentials Foundation Pack or the HP website (<http://www.hp.com/servers/smartstart>).

HP Insight Diagnostics

HP Insight Diagnostics is a proactive server management tool, available in both offline and online versions, that provides diagnostics and troubleshooting capabilities to assist IT administrators who verify server installations, troubleshoot problems, and perform repair validation.

HP Insight Diagnostics Offline Edition performs various in-depth system and component testing while the OS is not running. To run this utility, launch the SmartStart CD.

HP Insight Diagnostics Online Edition is a web-based application that captures system configuration and other related data needed for effective server management. Available in Microsoft® Windows® and Linux versions, the utility helps to ensure proper system operation.

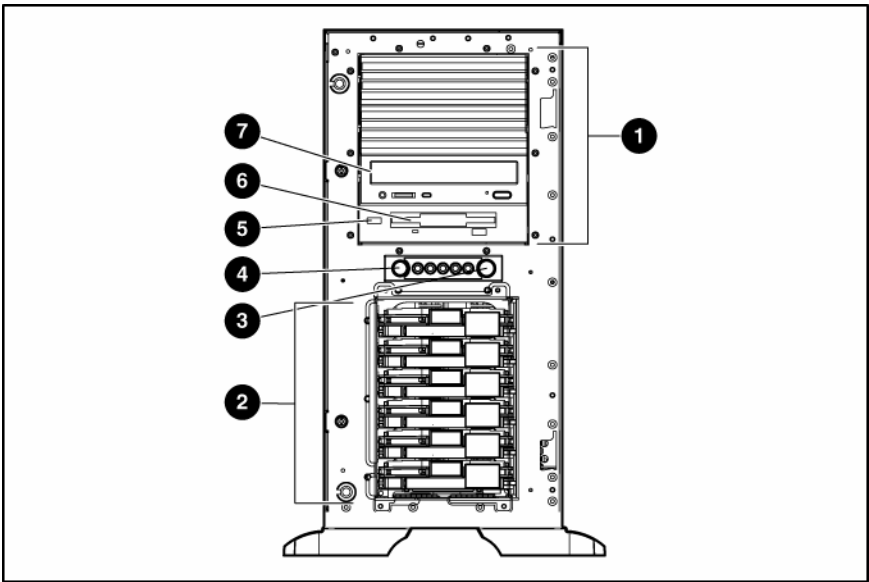
For more information or to download the utility, refer to the HP website (<http://www.hp.com/servers/diags>).

Server component identification

In this section

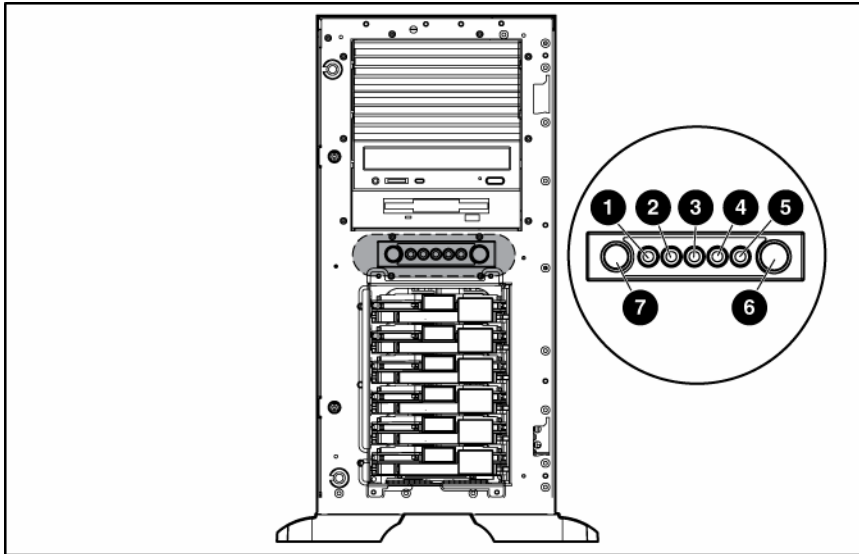
Front panel components	40
Front panel LEDs and buttons	41
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System LEDs and internal health LED combinations	46
System board LEDs	47
Hot-plug hard drive IDs	48
Hot-plug SCSI hard drive LEDs	49
SATA or SAS hard drive LEDs	50

Front panel components



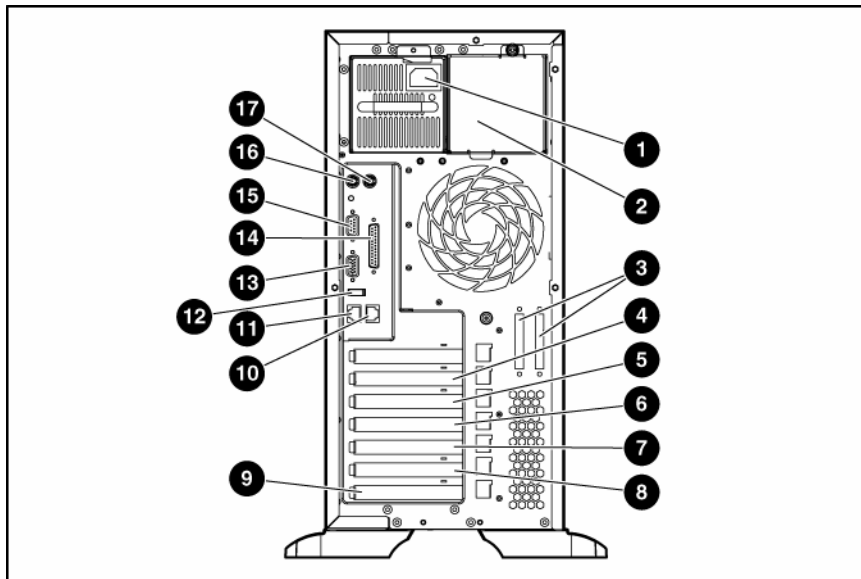
Item	Description
1	Removable media bays (4)
2	Hot-plug hard drive bays (6)
3	Power On/Standby button
4	UID button
5	USB connector
6	Diskette drive
7	CD-ROM drive

Front panel LEDs and buttons



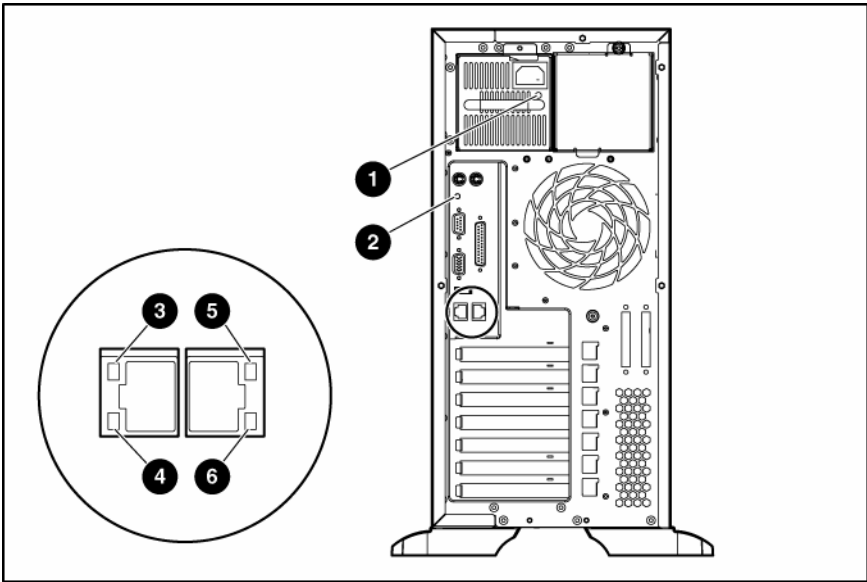
Item	Description	Status
1	UID LED	Blue = Activated Flashing = System remotely managed Off = Deactivated
2	Internal health LED	Green = Normal Amber = System degraded. Refer to system board LEDs (on page 47) to identify component in degraded state. Red = System critical. Refer to system board LEDs (on page 47) to identify component in critical state. Off = Normal (when in standby mode)
3	External health LED (power supply)	Green = Power supply OK Amber = Redundancy failure Red = Critical power failure
4	NIC activity LED	Green = Network link Flashing = Network link and activity Off = No link to network. If power is off, view the rear panel RJ-45 LEDs for status.
5	System power LED	On = Power Amber = System off and power available Off = No power
6	Power On/Standby button	—
7	UID button	—

Rear panel components



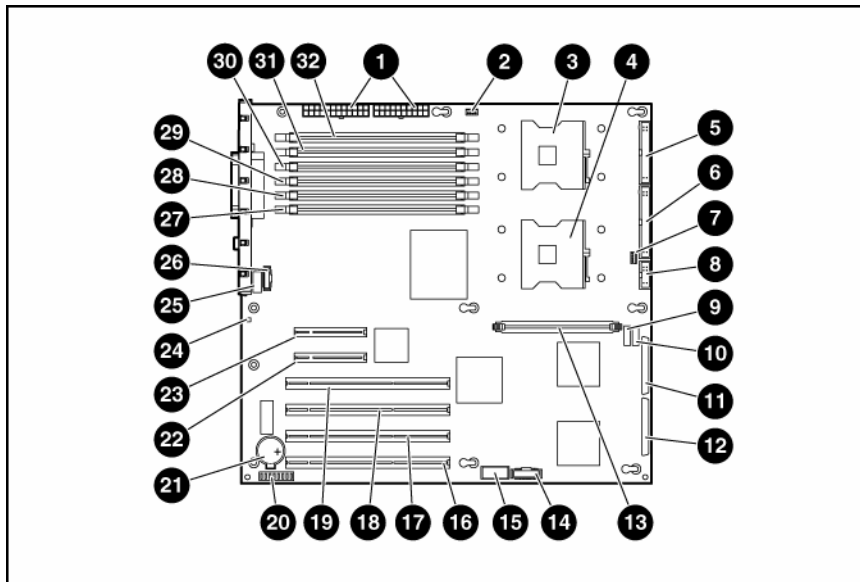
Item	Description
1	Power cord connector
2	Optional hot-plug redundant power supply bay
3	SCSI connector knockouts
4	PCI Express slot 1 (x4, half-length)
5	PCI Express slot 2 (x8 (full-length)
6	PCI-X slot 3 (bus 9, 64-bit/100-MHz)
7	PCI-X slot 4 (bus 9, 64-bit/100-MHz)
8	PCI-X slot 5 (bus 6, 64-bit/133-MHz)
9	PCI-X slot 6 (bus 2, 64-bit/66-MHz)
10	iLO Management connector
11	RJ-45 Ethernet connector
12	USB 2.0 connector
13	Video connector
14	Parallel connector
15	Serial connector
16	Keyboard connector
17	Mouse connector

Rear panel LEDs



Item	LED	Status
1	Power supply LED	Green = Power supply is on and functioning Off = No power or inadequate power supply
2	UID LED	Blue = Activated Flashing = Remote inquiry Off = Deactivated
3	10/100/1000 NIC link LED	On = Link Flashing = Activity Off = No link
4	10/100/1000 NIC standby LED	On = Standby Off = Activity
5	iLO NIC Activity LED	On = Link Flashing = Activity Off = No link
6	iLO NIC standby LED	On = Standby Off = Activity

System board components



NOTE: PPM 1 is embedded in the system board.

Item	Description
1	Power supply connectors
2	Processor 1 heatsink fan connector
3	Processor socket 1
4	Processor socket 2
5	Diskette drive connector
6	Primary IDE connector (ATAPI devices)
7	Processor 2 heatsink fan connector
8	Power button/LED connector
9	SATA 1 connector
10	SATA 2 connector
11	Primary SCSI connector
12	Secondary SCSI connector
13	PPM 2 slot
14	RILOE II connector (30-pin)
15	Serial port connector
16	PCI-X slot 6 (bus 2, 64-bit/66-MHz)
17	PCI-X slot 5 (bus 6, 64-bit/133-MHz)
18	PCI-X slot 4 (bus 9, 64-bit/100-MHz)
19	PCI-X slot 3 (bus 9, 64-bit/100-MHz)
20	System maintenance switch
21	System battery
22	PCI Express slot 2 (x8, full-length)
23	PCI Express slot 1 (x4, half-length)
24	NMI jumper

Item	Description
25	Redundant fan connector
26	System fan connector
27	DIMM slot 6 (bank C)
28	DIMM slot 5 (bank C)
29	DIMM slot 4 (bank B)
30	DIMM slot 3 (bank B)
31	DIMM slot 2 (bank A)
32	DIMM slot 1 (bank A)

NMI jumper

The NMI jumper allows administrators to perform a memory dump before performing a hard reset. Crash dump analysis is an essential part of eliminating reliability problems, such as hangs or crashes in operating systems, device drivers, and applications. Many crashes freeze a system, requiring you to do a hard reset. Resetting the system erases any information that would support root cause analysis.

Systems running Microsoft® Windows® operating systems experience a blue screen trap when the operating system crashes. When this happens, Microsoft® recommends that system administrators perform an NMI event by pressing a dump switch. The NMI event enables a hung system to become responsive again.

System maintenance switch

Position	Default	Function
S1	RILOE security	Off = RILOE security is enabled On = RILOE security is disabled
S2	Off	Off = System configuration can be changed. On = System configuration is locked.
S3	Off	Reserved
S4	Off	Reserved
S5	Off	Off = Power-on password is enabled. On = Power-on password is disabled.
S6	Off	Off = No function On = Clear NVRAM
S7	—	Reserved
S8	—	Reserved

When the system maintenance switch position 6 is set to the On position, the system is prepared to erase all system configuration settings from both CMOS and NVRAM.

⚠ CAUTION: Clearing CMOS and/or NVRAM deletes configuration information. Be sure to properly configure the server or data loss could occur.

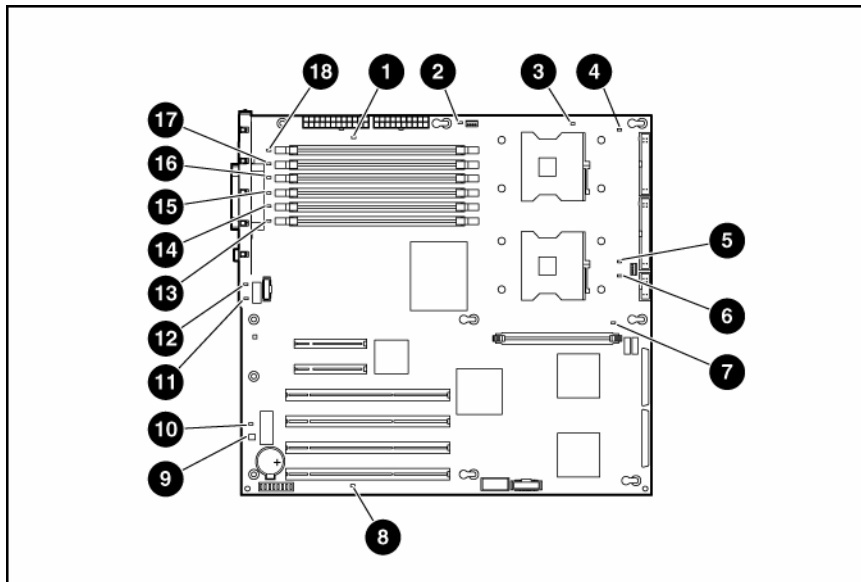
System LEDs and internal health LED combinations

When the internal health LED on the front panel illuminates either amber or red, the server is experiencing a health event. Combinations of illuminated system LEDs and the internal health LED indicate system status.

The front panel health LEDs indicate only the current hardware status. In some situations, HP SIM may report server status differently than the health LEDs because the software tracks more system attributes.

System LED and Color	Internal Health LED Color	Status
Processor failure, socket X (amber)	Red	One or more of the following conditions may exist: <ul style="list-style-type: none">• Processor in socket X has failed.• Processor in socket X failed over to the second processor.• Processor X is not installed in the socket.• Processor X is not supported.• Processor heatsink is not attached properly.
	Amber	Processor in socket X is in a pre-failure condition.
Processor failure, both sockets (amber)	Red	Processor types are mismatched.
PPM failure (amber)	Red	<ul style="list-style-type: none">• PPM has failed.• PPM is not installed, but the corresponding processor is installed.
DIMM failure, slot X (amber)	Red	<ul style="list-style-type: none">• DIMM in slot X has failed.• DIMM in slot X is an unsupported type, and no valid memory exists in another bank.
	Amber	<ul style="list-style-type: none">• DIMM in slot X has reached single-bit correctable error threshold.• DIMM in slot X is in a pre-failure condition.• DIMM in slot X is an unsupported type, but valid memory exists in another bank.
Overtemperature (amber)	Red	<ul style="list-style-type: none">• The Health Driver has detected a cautionary temperature level.• The server has detected a hardware critical temperature level.
Fan (amber)	Red	The minimum fan requirements are not being met. Fan has failed.
	Amber	A fan has failed but still meets the minimum fan requirements (with redundant system fan option only).

System board LEDs



Item	LED description	Status
1	AC power	Off = No AC power or failed power supply Green = Power supply is on and functioning
2	Processor 1 fan status	Off = Processor fan is functioning Amber = Fan is not installed or has failed
3	Processor 1 status	Off = Processor 1 functioning Amber = Processor 1 failed
4	PPM 1 (embedded) status	Off = PPM 1 is functioning Amber = PPM 1 has failed
5	Processor 2 fan status	Off = Processor fan is functioning Amber = Fan is not installed or has failed
6	Processor 2 status	Off = Processor 1 is functioning Amber = Processor 1 has failed
7	PPM 2 status	Off = PPM 2 is functioning Amber = PPM 2 has failed
8	Temperature threshold	Off = Normal Amber = System temperature threshold has been exceeded
9	Memory status	Off = Normal Amber = Memory has failed or configuration problem has occurred
10	Online spare memory failover	Off = Normal Amber = Online spare memory is in use because of memory failover
11	Redundant fan status	Off = Fan is functioning Amber = Redundant fan has failed
12	Rear fan status	Off = Processor fan is functioning Amber = Fan is not installed or has failed

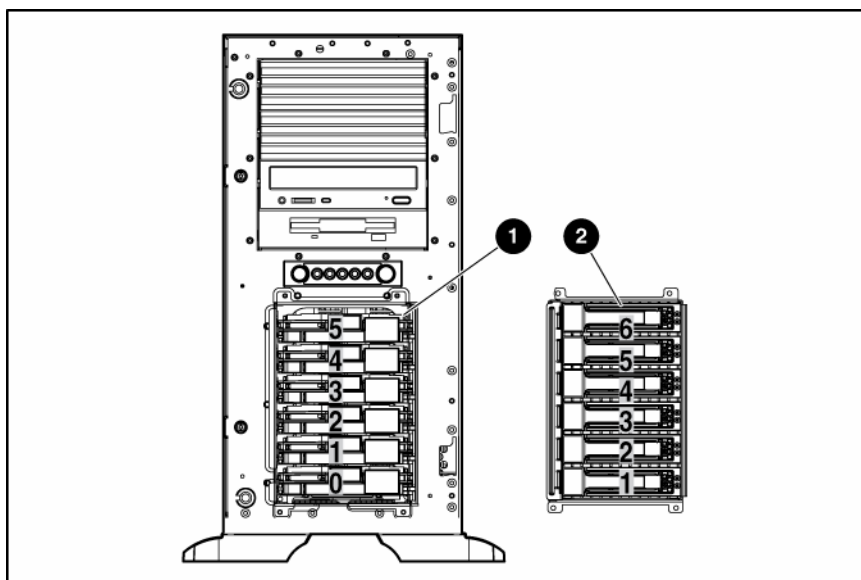
Item	LED description	Status
13	DIMM 6 status	Off = DIMM 6 is functioning Amber = DIMM 6 has failed
14	DIMM 5 status	Off = DIMM 5 is functioning Amber = DIMM 5 has failed
15	DIMM 4 status	Off = DIMM 4 is functioning Amber = DIMM 4 has failed
16	DIMM 3 status	Off = DIMM 3 is functioning Amber = DIMM 3 has failed
17	DIMM 2 status	Off = DIMM 2 is functioning Amber = DIMM 2 has failed
18	DIMM 1 status	Off = DIMM 1 is functioning Amber = DIMM 1 has failed

Hot-plug hard drive IDs

SCSI models of the HP ProLiant ML350 Generation 4p Server support single- or dual-channel SCSI hard drive configurations. The single-channel configuration (simplex) supports up to six SCSI hard drives on one channel. The dual-channel configuration (duplex) supports two SCSI hard drives on one channel (SCSI IDs 4 and 5) and up to four SCSI hard drives on the other channel (SCSI IDs 0 through 3) with the duplex option.

The SCSI IDs for both simplex and duplex configurations are illustrated. Always populate hard drive bays starting with the lowest SCSI ID.

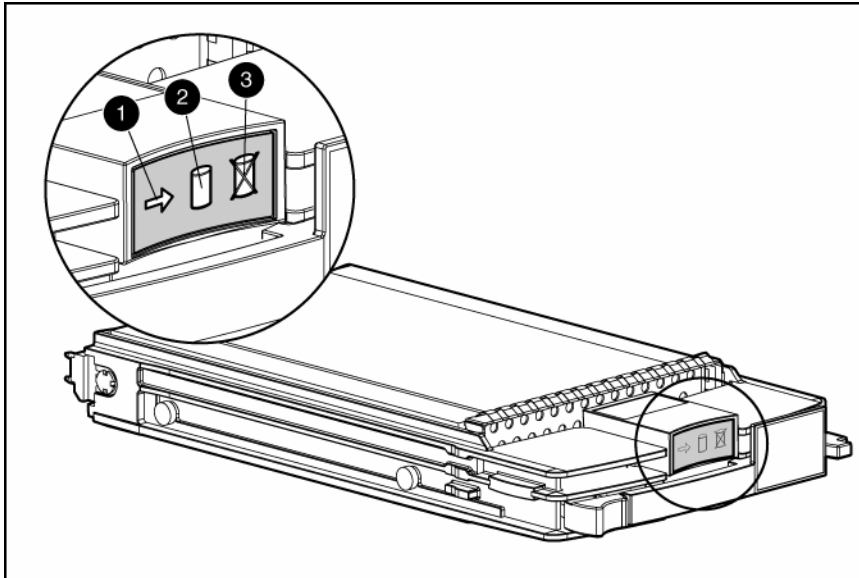
SATA models of the HP ProLiant ML350 Generation 4p Server support up to six hard drives. The embedded SATA controller supports drives in bays 1 and 2 (SATA IDs 1 and 2). An optional controller is required to support drives in bays 3 through 6 (SATA IDs 3 through 6). The hot-plug SATA drive cage also supports 8.89-cm (3.5-in) SAS hot-plug hard drives. An optional SAS controller is required to support SAS drives.



Item	Description
1	Hot-plug SCSI hard drive cage

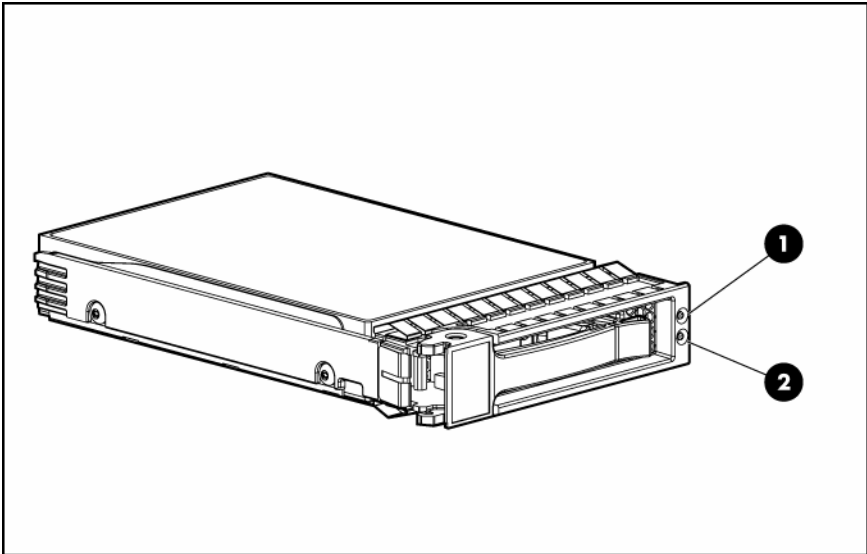
Item	Description
2	Hot-plug SATA hard drive cage (SAS-enabled)

Hot-plug SCSI hard drive LEDs



Item	LED description	Status
1	Activity status	On = Drive activity Flashing = High activity on the drive or drive is being configured as part of an array. Off = No drive activity
2	Online status	On = Drive is part of an array and is currently working. Flashing = Drive is actively online. Off = Drive is offline.
3	Fault status	On = Drive failure Flashing = Fault-process activity Off = No fault-process activity

SATA or SAS hard drive LEDs



Item	LED description	Status
1	Online/Activity status	Green = Drive activity Flashing green = High activity on the drive or drive is being configured as part of an array Off = No drive activity
2	Fault/UID status	Amber = Drive failure Flashing amber = Fault-process activity Blue = Unit identification is active Off = No fault-process activity

Specifications

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Tower server specifications

Specification	Value
Dimensions	
Height	44.45 cm (17.50 in)
Depth (with bezel)	64 cm (25.2 in)
Width	22 cm (8.66 in)
Weight (no drives installed)	27.22 kg (60 lb)
Models with a redundant power supply	
Input requirements	
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	47 Hz to 63 Hz
Rated input current	10 A (110 V) to 5 A (220 V)
Rated input power	893 W
BTUs per hour	3049
Power supply output	
Rated steady-state power	700 W
Maximum peak power	725 W

Rack server specifications

Specification	Value
Dimensions	
Height	21.87 cm (8.61 in)
Depth (with bezel)	50.17 cm (19.75 in)
Width (with bezel)	48.26 cm (19 in)
Weight (no drives installed)	27.24 kg (60 lb)

Models with a redundant power supply	
Input requirements	
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	47 Hz to 63 Hz
Rated input current	10 A (110 V) to 5 A (220 V)
Rated input power	893 W
BTUs per hour	3049
Power supply output	
Rated steady-state power	725 W
Maximum peak power	725 W

Environmental specifications

Specification	Value
Temperature range*	
Operating	10°C to 35°C (50°F to 95°F)
Shipping	-40°C to 70°C (-40°F to 158°F)
Maximum wet bulb temperature	28°C (82.4°F)
Relative humidity (noncondensing)**	
Operating	10% to 90%
Non-operating	5% to 95%

* All temperature ratings shown are for sea level. An altitude derating of 1°C per 300 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed.

** Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.

Hot-plug power supply calculations

For hot-plug power supply specifications and calculators to determine electrical and heat loading for the server, refer to the HP Enterprise Configurator website (<http://h30099.www3.hp.com/configurator/>).

DDR2 SDRAM DIMM specifications



NOTE: Use only 512-MB, 1-GB, 2-GB, 72-bit wide, PC2 3200 Registered ECC DDR2 SDRAM. Use HP-branded DDR2 SDRAM only.

Item	Description
Size	512 MB, 1 GB, 2 GB
Width	72 bits
Upgrade requirement	Any combination of like-paired DDR2 SDRAM DIMMs that provide a minimum of 512 MB

1.44-MB diskette drive specifications

Specification	Value
Dimensions	
Height	12.7 mm (0.5 in)
Width	96 mm (3.8 in)
Depth	130 mm (5.1 in)
LEDs (front panel)	Green = Active
Read/write capacity per diskette	
High density	1.44 MB
Low density	720 KB
Drives supported	1
Drive height	One-third height
Drive rotation	300 rpm
Transfer rate	
High	500 Kb/s
Low	250 Kb/s
Bytes/sector	512
Sectors per track (high/low)	18/9
Tracks per side (high/low)	80/80
Access times	
Track-to-track (high/low)	3 ms/6 ms
Average (high/low)	169 ms/94 ms
Settling time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

CD-ROM drive specifications

Specification	Value
Disk formats	CD-ROM (modes 1 and 2); mixed mode (audio and data combined); CD-DA; Photo CD (single/multiple-session), CD-XA ready; CDi ready
Capacity	550 MB (mode 1, 12 cm)
	640 MB (mode 2, 12 cm)
Block size	2368, 2352 bytes (mode 0)
	2352, 2340, 2336, 2048 bytes (mode 1)
	2352, 2340, 2336, 2048 bytes (mode 2)
Dimensions	
Height	12.7 mm (0.50 in)
Depth	132.08 mm (5.20 in)

Specification	Value
Width	132.08 mm (5.20 in)
Weight	0.34 kg (0.75 lb)
Data transfer rate	
Sustained	150 KB/s (sustained 1X), 1500/3600 KB/s (10X to 24X)
Burst	16.6 MB/s
Access times (typical)	
Full stroke	300 ms
Random	140 ms
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)
Track pitch	1.6 μm (6.3×10^{-7} in)
Cache/buffer	128 KB
Startup time	< 10 s
Stop time	< 5 s (single); < 30 s (multisession)
Laser parameters	
Type	Semiconductor laser GaAs
Wave length	700 \pm 25 nm
Divergence angle	53.5° \pm 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 55°C (41°F to 131°F)
Humidity	10% to 80%

Acronyms and abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

ADU

Array Diagnostics Utility

ASR

Automatic Server Recovery

ATAPI

Advanced Technology Attachment Packet Interface

DDR

double data rate

DIMM

dual inline memory module

HD68

high density 68

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

IPL

initial program load

IRQ

interrupt request

ISEE

Instant Support Enterprise Edition

MPS

multi-processor specification

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NIC

network interface controller

NMI

non-maskable interrupt

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

PCI Express

peripheral component interconnect express

PCI-X

peripheral component interconnect extended

PDU

power distribution unit

POST

Power-On Self Test

PPM

processor power module

PSP

ProLiant Support Pack

PXE

Preboot Execution Environment

RBSU

ROM-Based Setup Utility

RILOE II

Remote Insight Lights-Out Edition II

SAS

serial attached SCSI

SATA

serial ATA

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

SIM

Systems Insight Manager

TMRA

recommended ambient operating temperature

UID

unit identification

VHDCI

very high density cable interconnect

WOL

Wake-on LAN

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